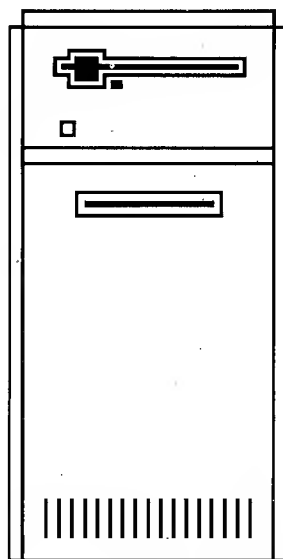

Molecular ComputerTM

Multiprocessor Computer Systems



Hardware Maintenance Manual
Supermicro Series

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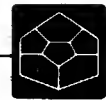
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PREFACE

This manual describes how to maintain, troubleshoot, and repair a Supermicro series computer. It provides enough information for you to understand the general theory of operation of the computer, and for you to perform tasks such as troubleshooting, disassembly, reassembly, and adjustment at a field-replaceable unit level. This manual is written for you if you are a computer technician or engineer familiar with the terms and concepts of the microcomputer industry, and if you have a working knowledge of the tools and techniques commonly associated with an electronic technician. In addition, it is assumed that you have some familiarity with computer software fundamentals and the CP/M Operating System. If you have no experience with CP/M, read the CP/M Operating System Manual in conjunction with this manual.

The next section, Chapter Summary, briefly describes the chapters in this manual and suggests a reading path to help you use the manual efficiently. Note that installation information is provided in the companion manual Supermicro Installation and User Reference Manual, and is not duplicated here.

Chapter Summary

Chapter 1, Introduction, provides a very brief overview of the Supermicro computer and explains the purpose of this manual.

Chapter 2, Theory of Operation, discusses the theory and principles of operation of the computer and its two main components, the file processor and the application processor, as well as providing a brief description of the hard disk drive, the diskette drive, the tape drive, and the power supplies.

Chapter 3, System Expansion, describes the procedures for adding hard disk drives and tape drives to each of the Supermicro models.

Chapter 4, Corrective Maintenance, explains how to troubleshoot the Supermicro to isolate a fault to the field-replaceable part, and goes on to describe how to replace the faulty item with a properly functioning one.

Chapter 5, Schematic Diagrams and Component Locators, provides copies of the engineering drawings for each of the standard electronic assemblies in the computer.

Documentation Conventions

A description of the symbolic conventions used throughout this manual follows. Familiarize yourself with these conventions before you continue reading.

Conventions used in this manual:

1. This manual uses the word RETURN to represent a carriage return, CTRL to represent the control key, and BREAK to represent any key or combination of key strokes that will reset the processor.

You may produce unique characters by typing a combination of keys simultaneously. For example, while holding down the CTRL key, type O to produce the CTRL-O characters. Key combinations such as these are hyphenated in this manual.



2. Terminal and console terminal are general terms used throughout all Supermicro documentation to represent any terminal device.
3. In discussions of command syntax, upper-case letters represent command names which you must type. Lower-case italics represent a variable for which you must supply an entry.

Braces {} enclose options. You may include the item in brackets, or may omit it as you choose. This is a typical illustration of command syntax:

`HOLD unit{/port}`

This example shows that you must type the word HOLD followed by an entry that specifies the unit. Without leaving a space you may follow the unit entry with a slash [/] and an entry that identifies the port. Here is a typical command string:

`HOLD 210/A`



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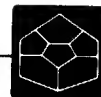
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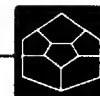
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INTRODUCTION

1

The Supermicro 8, Supermicro 32, and Supermicro 64 computer systems are each different configurations of a multiuser, multiprocessing, Z80-based microcomputer system. This manual covers theory of operation, system expansion, and corrective maintenance for each of the Supermicro systems. For installation, user, and programming information, see the companion to this manual, the **Supermicro Installation and User Reference Manual**.

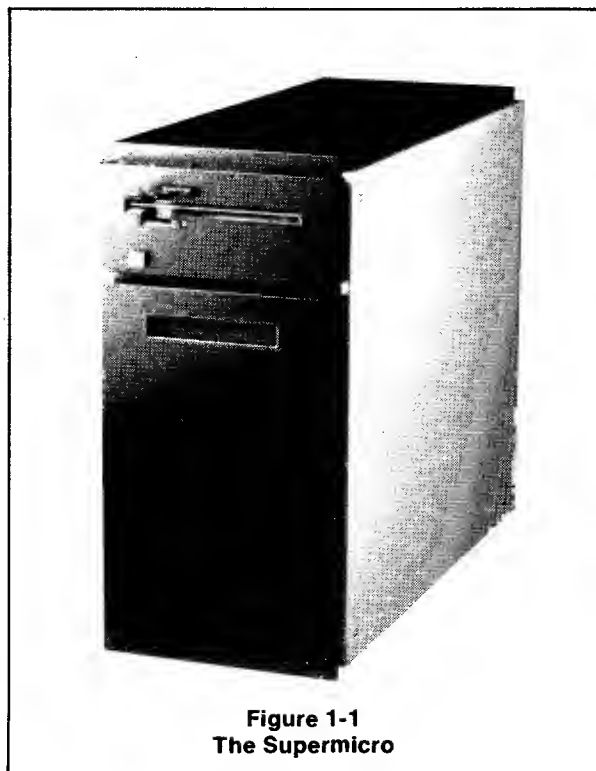


Figure 1-1
The Supermicro

To begin your understanding of the Supermicro system, Chapter 2 of this manual provides a comprehensive theory of operation at a block diagram level. Next, Chapter 3 describes the procedures for expanding your system to include additional hard disk drives and tape drives. Chapter 4 completes your knowledge by explaining how to perform corrective maintenance. All procedures are supported to a field-replaceable assembly level. No procedures for component-level troubleshooting are provided.

In addition to the basic maintenance information in this manual, several appendices are provided, covering vendor-supplied equipment and diagnostic programs.

For a general description of the Supermicro system and for system specifications, refer to your **Supermicro Installation and User Reference Manual**.



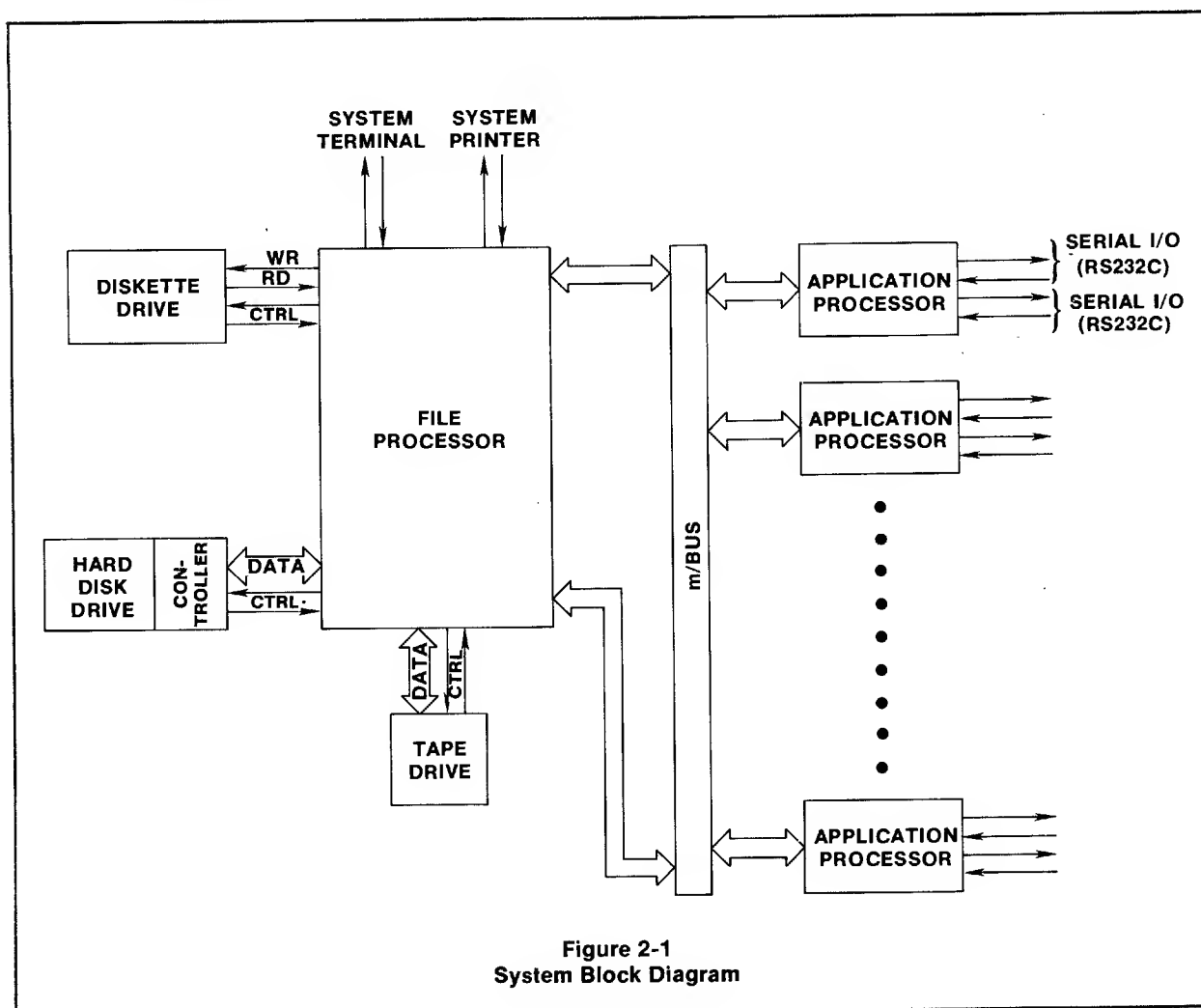
THEORY OF OPERATION

2

This section of the manual discusses the theory and principles of operation of the microcomputer system and its two main functional components, the file processor and the application processor. It also describes briefly the system's vendor-supplied equipment, namely, the diskette, hard-disk, and tape drives, and the DC power supplies.

2.1 SYSTEM ARCHITECTURE

Figure 2-1 is a simplified system block diagram. All communication between the file processor (FP) and the application processors (AP), as well as between the APs, takes place via the m/BUS. This bidirectional, parallel-line bus carries 8-bit data bytes and includes 5 dedicated control signal lines. Both ends of all bus lines are "terminated" on the FP.





The m/BUS operates under a protocol known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD). This protocol resolves conflicts when two or more processors request access at the same time, by allowing only one processor to gain control, based upon the processor's individual physical address. The more 1 bits in the address, the higher the priority for m/BUS access. Thus, the file processor's address is 255 decimal (FFH) so that it will always win in a contention situation; the application processors have addresses up to 254 decimal (FEH).

If a contending processor fails to gain access to the bus, it tries again after an interval of time. This interval is determined by the system software in such a way as to prevent the processors with fewer 1 bits in their addresses from being permanently locked out.

As shown in Figure 2-1, the file processor also communicates with the hard-disk drive and tape drive over bidirectional data buses and control lines. Read/write and control signals between the FP and the diskette drive move over dedicated, unidirectional lines. The FP communicates with the system terminal and printer via RS232C interface lines.

2.2 BOOTSTRAP LOADING

The following procedure assumes that the terminal is connected to the file processor. The messages listed are displayed via the file processor terminal port.

When the system is powered on, the terminal should display the message "FP RESTART." If this message is not displayed, there is a problem with the system and none of the following procedures will work.

The remainder of the boot procedure is shown in Figure 2-2.

After power on, the system first waits for the disk drive(s) to come up to speed. The system gives the hard disk(s) up to 1 minute to come up to speed. At the end of this time, the system then checks whether or not there is a floppy diskette in the diskette drive.

If a diskette is installed, the system next checks the boot code and format on the diskette. If the format is not correct, or if the boot code is not present, the system terminal displays:

FLOPPY DISK ERROR XX

where XX is the diskette status byte. If the format and boot code are satisfactory, the system attempts to boot from the diskette.

If the boot is not successful, the system terminal displays the message:

POST BOOT ERROR XX

where XX is the first byte actually read from the diskette. If, on the other hand, the boot is successful, the system loads CP/M and comes up in the diagnostic mode, with the prompt A> on the system terminal.



If the hard disk comes up to speed and there is no diskette in the diskette drive, the system checks the hard disk for correct format and for the presence of the boot code. If the format or boot code test does not pass, the system displays the message:

HARD DISK ERROR XX

where XX is the hard disk error register status byte. If the format and boot code tests pass, the system attempts to boot from the hard disk. If the boot is unsuccessful, the system displays the message:

POST BOOT ERROR XX

where XX is the first byte actually read from the hard disk. Finally, if the boot is successful, the system loads n/STAR and comes up in multiuser mode. In this case, the system terminal continues to display the message "FP RESTART," while all terminals connected to application processors display the logged off screen.

Note that you can bring up the system in multiuser mode from a terminal connected to one of the application processors. However, if one of the errors just mentioned occurs, the error messages are displayed only on the system terminal.

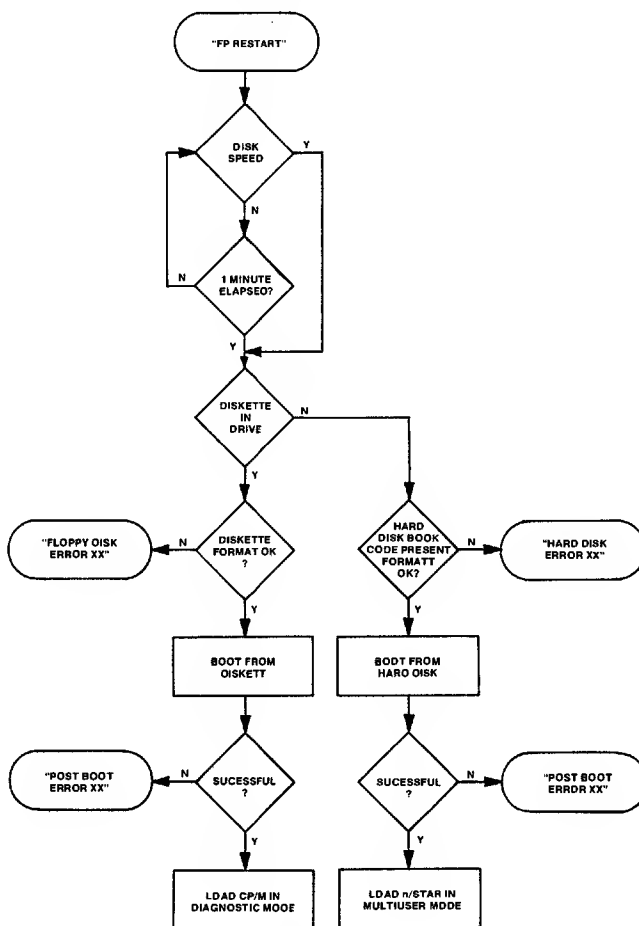


Figure 2-2
System Boot Procedure



2.3 FILE PROCESSOR

The file processor is a printed-circuit board assembly mounted horizontally inside the computer cabinet just above the diskette drive. All input/output connections to the FP are made through six ribbon cable connectors and two power harness connectors on the PCB. The FP input/output signals are summarized in Table 2-1. Note that a slash following a signal name (e.g., BUSY/) indicates the low/true logic state (generally a zero or slightly positive voltage level). This is the complement of the signal shown without a slash, which signifies the high/true state (+2.5 to +4-volt level).

The file processor consists of the functional blocks shown in Figure 2-3. The CPU controls the movement of data in the system according to the program instructions stored in the RAM. The CPU addresses the RAM and boot PROM by way of the address bus. Address lines A0,1 are also used to select the individual functions of the LSI family part in the file processor. All data transfer between the CPU and memory or I/O interfaces takes place over the data bus.

NOTE

1. Single lines between blocks may each represent more than one physical signal path.
2. Not all control signal lines between CPU and other blocks are shown.

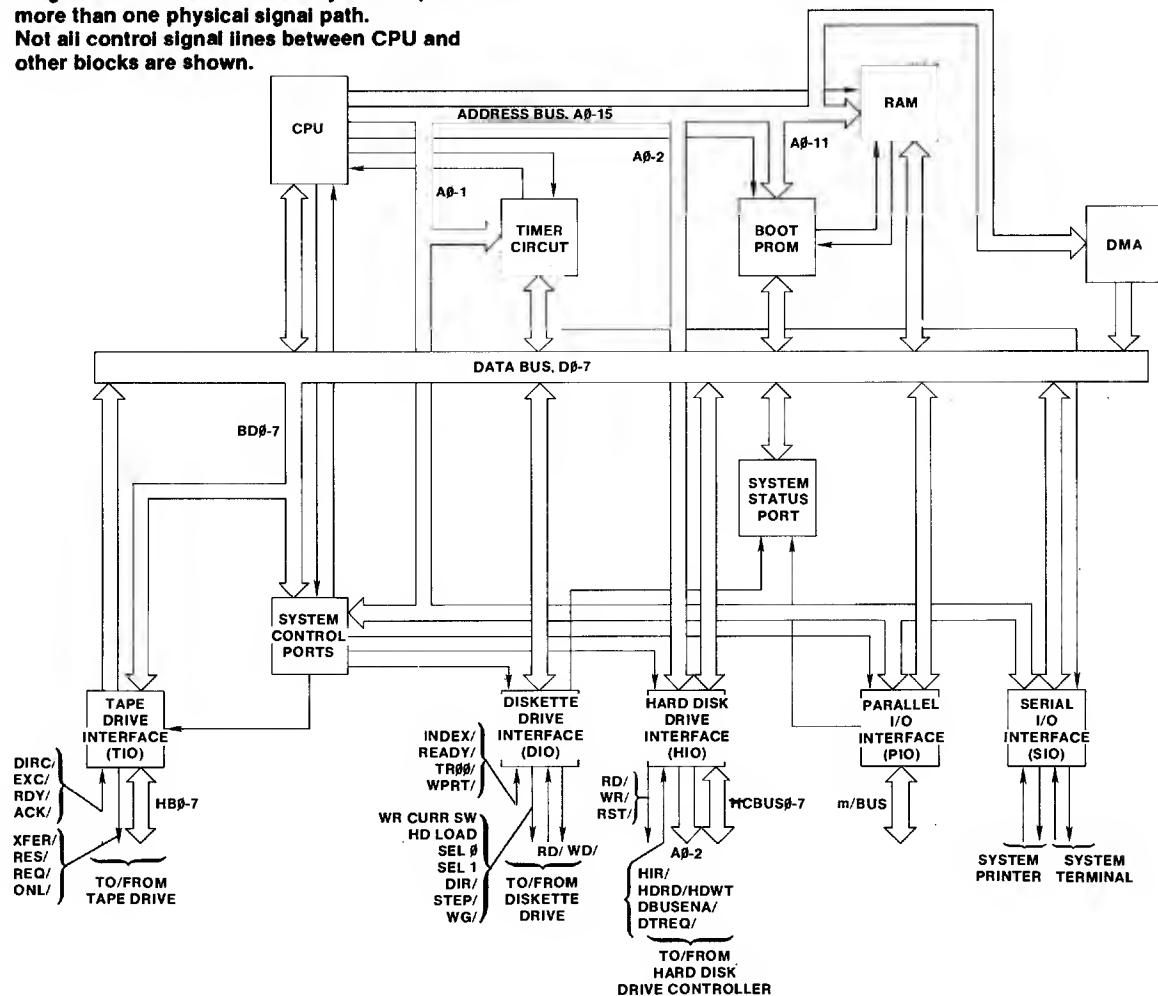


Figure 2-3
File Processor Block Diagram



TABLE 2-1 - FILE PROCESSOR INPUT/OUTPUT SIGNALS

Connector Pin	Signal Name	I/O	Definition/Function
J1 - Serial Interface—system terminal			
3	TD	I	Transmit Data; serial-bit data from terminal
4	TC	I	Transmit Clock (not used)
5	RD	O	Receive Data; serial-bit data to terminal
7	RTS	I	Request to Send; indicates that terminal is set to transmit data to host
8	RC	I	Receive Clock (not used)
9	CTS	O	Clear to Send; indicates that host is set to send data to terminal
11	DSR	O	Data Set Ready; indicates that host is ready to receive data from terminal
13	GND	—	Ground
14	DTR	I	Data Terminal Ready; indicates that terminal is ready to receive data from host
J2 - Serial Interface—system printer			
23	TD		
25	RD		
27	RTS		
29	CTS	—	See system terminal pin assignments
31	DSR		
33	GND		
34	DTR		
J3 - Power Control			
1	+24	I	+24 V line from power supply
2	+5	I	Not used
3		O	Current output to energize power latch relay (K2 in Figure 2-5)
4	+24	O	+24 V output line
5	GND	—	Ground
6	—	—	Not used



J4 - Hard-Disk Drive Interface

1	GND	—	Ground
2-9	HCBUSO-7	I/O	Host Control Bus; bidirectional host bus for control, status, and read/write data signals
10	GND	—	Ground
11	RD/	O	Read; places contents of selected drive controller register (decode of A0-2) on HC bus
12	GND	—	Ground
13	WR/	O	Write; loads HC bus signals into selected drive controller register (decode of A0-2)
14	GND	—	Ground
15-17	A0-2	O	Address Lines 0-2; select one of the eight drive controller register pairs for RD/ or WR/ operation
18	GND	—	Ground
19	RST/	O	Reset; resets drive controller logic
20	GND	—	Ground
21	HIR/	I	Host Interrupt Request; CPU interrupt request signal from drive controller
22	GND	—	Ground
23	HDRD/HDWT*	I	Host Data Read/Write; indicates direction of data transfer on HC bus: High = Host read (drive controller to FP) Low = Host write (FP to drive controller)
24	DBUSENA/†	I	Data Bus Enabled; indicates that drive controller is enabled and ready for data transfer
25	GND	—	Ground
26	DTREQ/	I	Data Transfer Request; request from drive controller for HC bus data transfer from host
27	GND	—	Ground
28-40	NC	—	—

J5 - m/BUS—terminator end
See J8



J6 - Diskette Drive Interface

2	WRITE CURR SW	O	Write Current Switch; enables flow of erase coil current in drive's R/W heads															
18	HEAD LOAD/	O	Head Load; loads R/W heads against diskette preparatory to data read/write															
20	INDEX/	I	Index; physical index pulse provided by drive once each revolution to indicate beginning of data track															
22	READY/	I	Ready; indicates that drive is ready to read, write, or seek															
26	SEL0	O	(Side) Select address; select diskette side															
28	SEL1	O	(numbered 0 through 3) for data read/write according to following code: <table><tr><td>Side No.</td><td>SEL1</td><td>SEL0</td></tr><tr><td>0</td><td>H</td><td>H</td></tr><tr><td>1</td><td>H</td><td>L</td></tr><tr><td>2</td><td>L</td><td>H</td></tr><tr><td>3</td><td>L</td><td>L</td></tr></table> Where L = Low level (true) H = High level (false)	Side No.	SEL1	SEL0	0	H	H	1	H	L	2	L	H	3	L	L
Side No.	SEL1	SEL0																
0	H	H																
1	H	L																
2	L	H																
3	L	L																
34	DIR/	O	Direction (In); when signal is false, a STEP/ pulse moves R/W heads outward or away from center of disk. When signal is true, a STEP/ pulse moves R/W heads in toward center of disk															
36	STEP/	O	Step; causes R/W heads to move in direction defined by DIR/ signal															
38	WD/	O	Write Data; serial write data pulses to drive															
40	WG/	O	Write Gate; when true, enables writing of data on disk. When false, signal enables (a) data transfer from drive to FP, and (b) stopping of R/W heads.															
42	TR00	I	Track 00; indicates that drive's R/W heads are positioned at track zero (outermost data track)															
44	WPRT/	I	Write Protect; when true, indicates that writing of data on disk is inhibited															
46	RDAT/	I	Read Data; serial read data pulses from drive															



J7 - Tape Drive Interface

12	HB7		
14	HB6		
16	HB5		
18	HB4		
20	HB3		
22	HB3	I/O	Host Bus; bidirectional bus for transfer of data, control, and status signals between FP and drive
24	HB1		
26	HB0		
28	ONL/	O	On Line; when true, signal maintains data transfer between FP and drive
30	REQ/	O	Request; initiates command sequence to drive. Also used to transfer status byte in conjunction with RDY/
32	RES/	O	Reset; resets drive logic
34	XFER/	O	Transfer; during write command, signal indicates a data byte is present on host bus. During read, signal indicates that FP has read a data byte
36	ACK/	I	Acknowledge; during write command, signal indicates that byte has been transferred from data bus to drive. During read, signal indicates that drive has placed a byte on data bus
38	RDY/	I	Ready; indicates a number of conditions, depending on operation commanded by FP, as follows:
		Operation	RDY/ Indication
		Command transfer	Drive has accepted command from FP
		Read status	Drive has placed status byte on host data bus
		Positioning	Drive has completed position command
		Write	Drive is ready for transfer of data byte from FP
		Read	Drive is ready to transfer data byte to FP
		Idle	Drive is ready to accept command from FP



40	EXC/	I	Exception; signal terminates a command when drive is unable to execute or continue command properly. Also indicates a reset, cartridge-not-inserted, or power-on condition
42	DIRC/	I	Direction Control; indicates direction of data transfer on host data bus: High = Host write (FP to drive) Low = Host read (drive to FP)

J8 - Parallel I/O Interface

All odd-numbered pins from 1 to 25 inclusive are ground

2	MB0/		
4	MB1/		
6	MB2/		
8	MB3/	I/O	m/BUS Data; bidirectional bus lines for data transfer between FP and APs. All signals are low-active
10	MB4/		
12	MB5/		
14	MB6/		
16	MB7/		
18	ACK/	I/O	Acknowledge; indicated that data transmitted over m/BUS has been received
20	DAV/	I/O	Data Available; indicates that data is ready for transmission on m/BUS
22	BINT/	I/O	Bus Interrupt; indicates that a device address has been placed on the m/BUS. Causes timer circuit (Figure 2-3) to generate a CPU interrupt
24	BUSY/	I/O	Busy; when true after the contention cycle, this signal indicates that m/BUS is in use and cannot be seized by another device
26	RST/	O	Reset; m/BUS reset line



J9 - DC Power Input

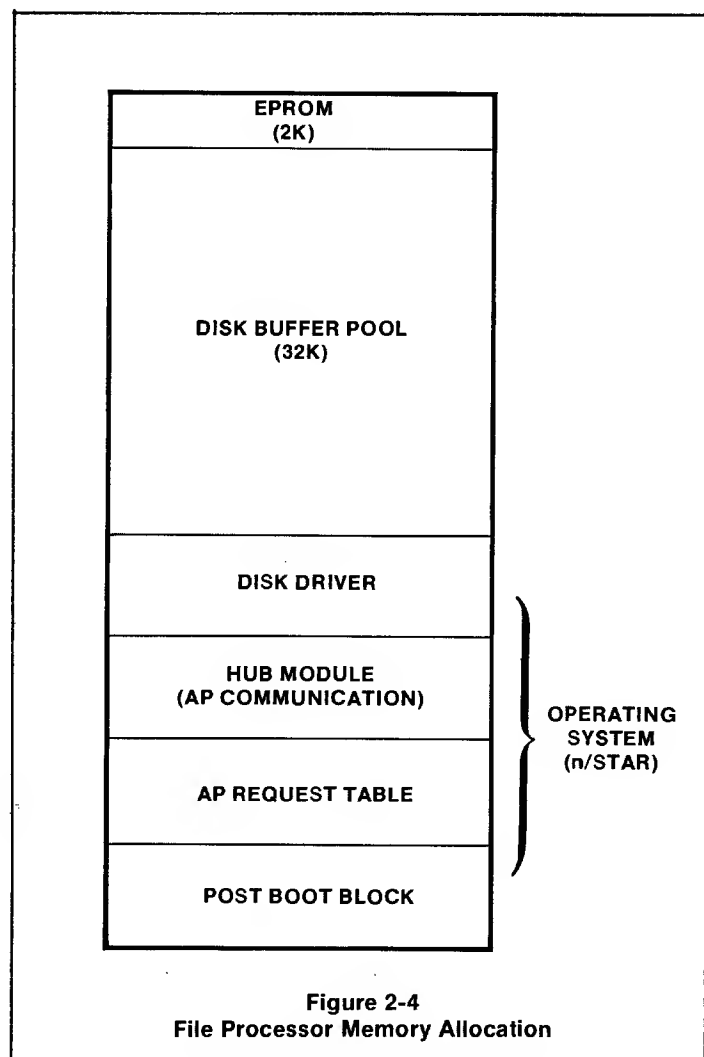
1,2	GND	—	
		Ground	
3,4	VCC		+ 5 V for electronic circuits
5	+12 V		+ 12 V for electronic circuits
6	-12 V		- 12 V for electronic circuits

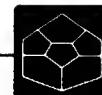
*On SM8, signal is SEQC/ (Sequence Complete)

†On SM8, signal is WAIT/

The CPU block also contains a DMA controller for block moves of data in the system.

The 64K RAM contains the system operating program (loaded from the diskette or hard-disk drive) and provides a 32K disk buffer pool (see Figure 2-4).





The RAM block also contains a parity error detector which initiates a CPU interrupt routine when a parity error is detected.

The timer circuit has three main functions: it produces the CPU vector-interrupt signals, generates the baud rate for the serial I/O interface (SIO), and acts as the system time clock.

The 2K boot PROM stores the routine used to load the operating program from diskette or disk to RAM after the system is powered up. The boot PROM also contains the instructions needed to differentiate among the three system configurations (SM8, SM32, and SM64).

The system control ports are used in selecting the required drive or m/BUS interfaces for input/output operations. This circuit is also used to select the system status port, which then places status information from the diskette drive interface and the parallel I/O interface on the data bus.

The diskette drive interface (DIO) converts write data bytes from the CPU into serial-bit pulses for recording by the drive. Conversely, the DIO receives serial read pulses from the drive and converts them into read data bytes for processing by the CPU.

The hard disk drive interface (HIO) communicates with the drive controller over a bidirectional bus which carries read/write data, control/status information, and a number of dedicated output and input lines used for handshaking with the drive controller. Note that the SM8 uses an adaptor board (see Sec. 2.5) between the HIO and the drive controller.

The tape drive interface (TIO) serves a function similar to that of the HIO. The TIO, however, receives write data not directly from the FP's data bus but through a data buffer.

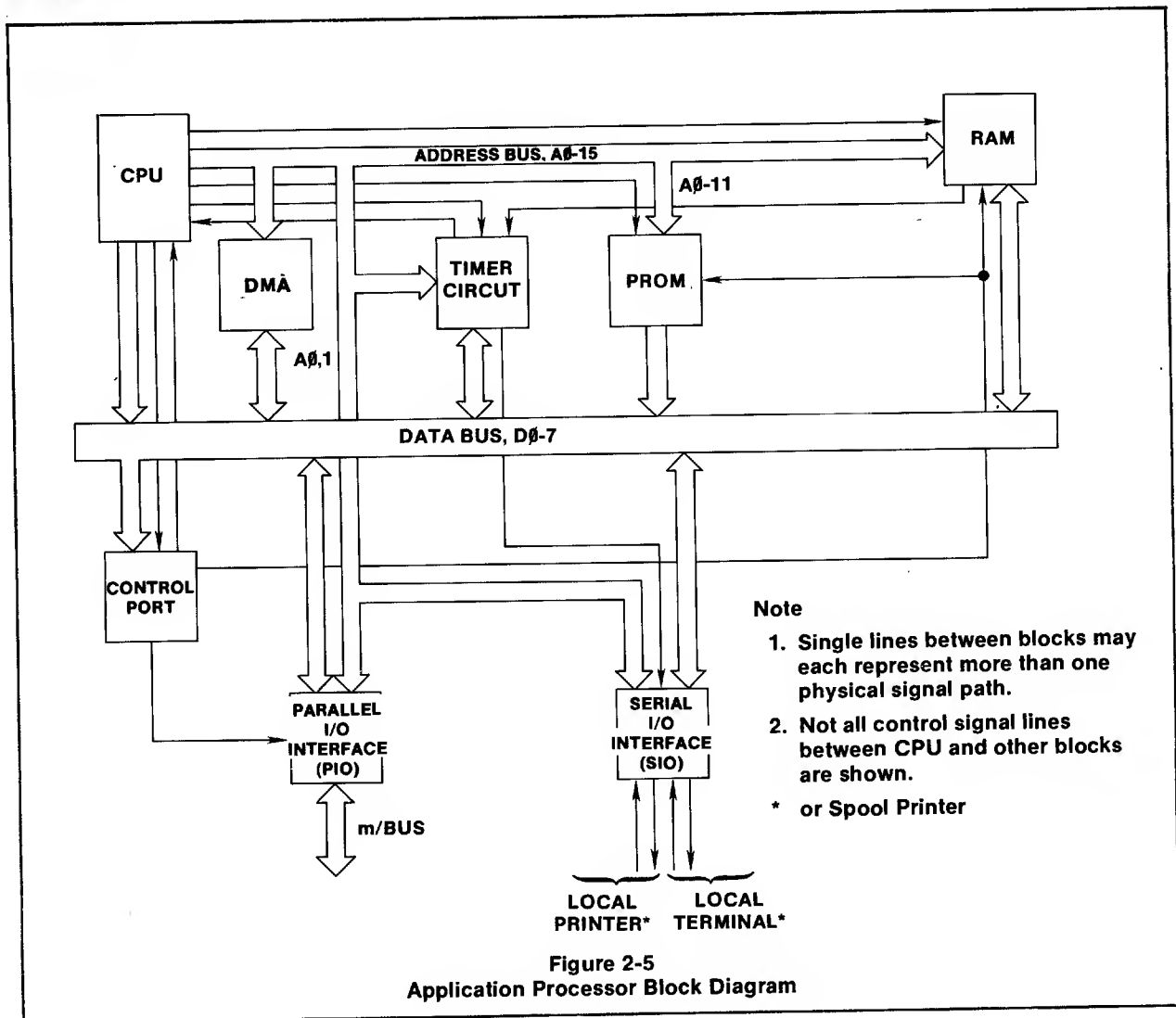
The parallel I/O interface (PIO) provides the necessary link for data transfer between the system m/BUS and the file processor's data bus.

The serial I/O interface (SIO) provides a data communication link between the file processor and a system terminal and printer through corresponding RS232C ports. The individual ports are selected by address coding on lines A0 and A1.

2.4 APPLICATION PROCESSOR

Each application processor is a plug-in circuit card that fits into a card cage slot at the back of the computer cabinet. All m/BUS lines are connected to the AP through the card's edge connector (J1). DC power is applied to the AP through a 6-pin connector (J2) on the card. J1 and J2 are arranged so that power is applied to the AP before the m/BUS connection is made when the card is plugged in. Local terminal and printer connections to the AP are made through two 25-pin D connectors (J3 and J4 respectively) at the back of the card.

As shown by the block diagram of Figure 2-5, the application processor circuitry is similar to that of the file processor. The application processor is much simpler than the file processor, due to the minimum amount of interfacing. CPU and RAM on the AP function in much the same way as on the file processor. The PROM contains the AP's logical address and program boot sequence plus miscellaneous housekeeping routines.



The timer circuit serves mainly as a CPU interrupt generator for non Z80-family devices, and as a baud rate generator for the serial I/O interface (SIO).

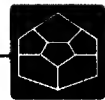
The parallel I/O interface and serial I/O interface have the same functions as on the file processor except that the AP's SIO communicates with a local terminal and printer. (The AP can be software-configured for despooling operation, in which case the terminal RS232C port is used for the first printer, while the printer RS232C port is used for the second printer.)

2.5 HARD-DISK DRIVE

The system's hard-disk drive provides for storage of the n/STAR operating system and for mass storage of data. Each of the three system models, SM8, SM32, and SM64, has a different hard-disk drive, as described below.

SM8

The hard-disk drive assembly in the SM8 consists of a Western Digital WD1000 controller, a WD1000 adaptor board, and from one to three Seagate ST 412 or RMS 512B 5 1/4-inch



disk drives. Each drive provides a data storage capacity of 10 megabytes. The adaptor board (see Chapter 5) acts as an interface between file processor and the drive controller. Note that +5-volt power is applied to drive 2. After approximately 10 seconds, power is applied to drive 1, and approximately 10 seconds after this, power is applied to drive 0.

The WD1000 controller and the disk drive are described in the corresponding vendor manuals (see Appendix A).

SM32

The hard-disk drive assembly in the SM32 consists of a PRIAM Smart "E" controller and PRIAM 3450 8-inch disk drive with a data storage capacity of 32 megabytes. The drive interfaces with the system file processor through the controller. The SM32 may include up to 3 additional disk drives, housed in a separate cabinet, for a total capacity of 128 megabytes. For further descriptions of the controller and drive, refer to the appropriate vendor manuals as listed in Appendix A.

SM64

The SM64 hard-disk drive assembly includes a 14-inch disk drive (PRIAM 6650), with a capacity of 62 megabytes, and a PRIAM Smart or Smart "E" controller, which serves as an interface between the drive and the file processor. In addition, the assembly contains its own DC power supply, which provides all the voltages required by the controller and drive. The SM64 may include an additional disk drive housed in a separate cabinet. For more information on the drive, controller, or power supply, see the appropriate vendor manuals as listed in Appendix A.

2.6 DISKETTE DRIVE

The system's diskette drive uses an 8-inch diskette and provides for loading the n/STAR diagnostic program into the file processor and for backup of data files. The diskette drive also makes it possible, when necessary, to load the n/STAR operating system onto the hard disk. With the diagnostic program loaded, the system operates entirely under CP/M with the diskette drive as logical drive A.

The SM8 and SM32 use a Tandon TM848-1 diskette drive providing for single sided and single or double density operation. The SM64 uses a Shugart 850 diskette drive providing for single or double sided and single or double density operation. Both drives are described in more detail in the corresponding vendor manuals (see Appendix A).



2.7 TAPE DRIVE

The system uses an Archive 3020I tape drive as optional equipment for 20 megabytes of data storage on an extra-length, DC 300XL data tape cartridge. The tape drive records in a "serpentine" manner on 4 adjacent data tracks. This means that when the end of a track is reached, the drive does not rewind but continues recording on the next track in the opposite direction. On the SM8 and SM32, the tape drive is housed in the same cabinet with the other equipment, while on the SM64, the drive is housed in a separate cabinet. For more information on the tape drive, refer to the vendor manual listed in Appendix A.

2.8 POWER SUPPLIES

Each Supermicro model has a different power supply configuration. The power control circuitry, however, is functionally equivalent in all systems.

Power is applied in the system through a relay control circuit as shown by the simplified schematic in Figure 2-6. With the rear panel circuit breaker (CB1) closed, pressing the front-panel power-on button (S1) applies AC power to the +24 V supply. This supply in turn energizes relay K1, which applies AC power to the other power supplies in the system. Once the file processor logic resets and stabilizes, it allows relay K2 to close and thus bypass switch S1. The entire process takes less than one second, so that if S1 is held down for at least that length of time, the system is electrically latched and remains powered on after S1 is released.

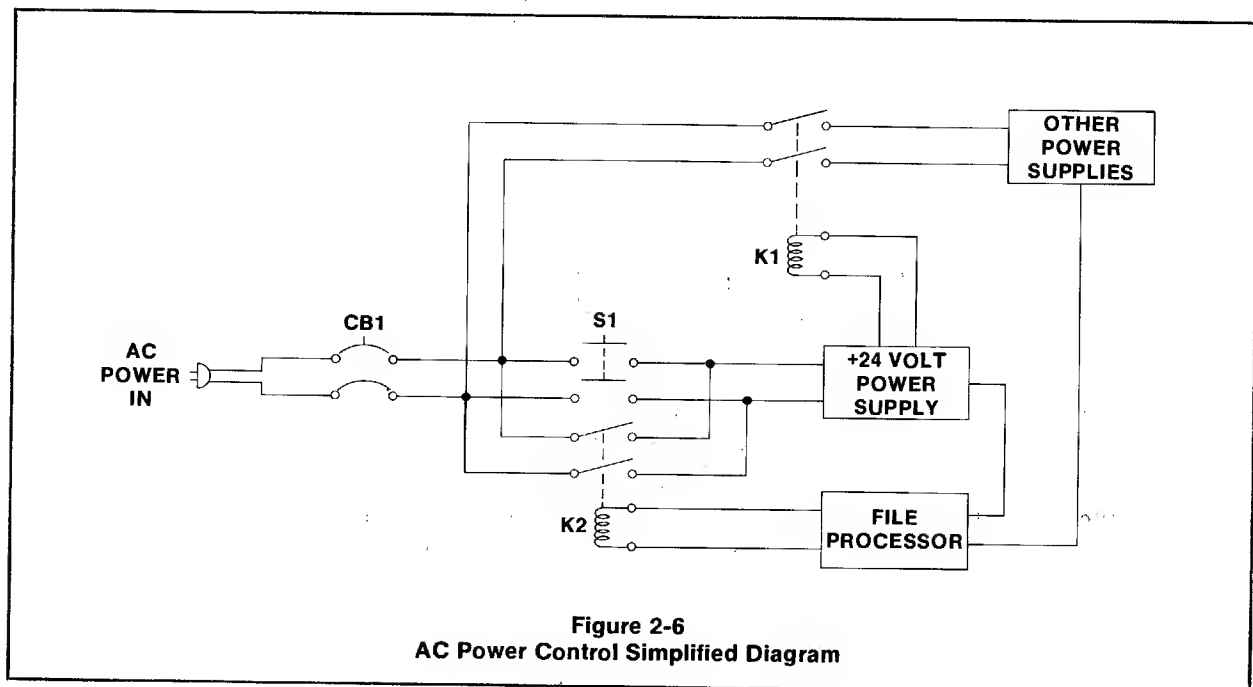


Figure 2-6
AC Power Control Simplified Diagram



Each of the three Supermicro models has a different power supply complement, as outlined below.

SM8

The SM8 has four separate power supplies (all made by Power One) providing the required DC voltages to the system equipment as follows:

<u>Supply</u>	<u>Voltage</u>	<u>Equipment Powered</u>
HE5-18/OVP	+ 5	All logic circuit boards
HD12-6.8	+ 12	File processor, application processor, hard-disk drive
HA15-0.5	- 12	File processor, application processor, hard-disk drive controller
HD24-4.8	+ 24	Diskette drive, tape drive, power-on indicator lamp and control relays

SM32

The SM32 contains two separate power supplies providing DC voltages as follows:

A Power One HD24-4.8 supplies + 24 volts for the diskette drive, the hard-disk drive, and the tape drive, as well as for the power-on lamp and control relays.

A Todd 400-3015 supplies ± 5 volts and ± 12 volts for the remainder of the equipment.

SM64

The SM64 uses two DC supplies: (1) a Power-One Sf 5-20, which provides + 5 volts to application processors 9 through 32; and ± 12 volts for the application processors; and (2) a Todd MOS-1002412 or Powermate ESM-100 supplying + 5 volts, ± 12 volts, and + 24 volts for all other system equipment except the PRIAM hard disk drive assembly, which has its own built-in supply. Note that the PRIAM power supply has been modified to provide 110 VAC for the diskette drive in the SM64.

For more information on the system power supplies, refer to the appropriate vendor documents (see Appendix A).



SYSTEM EXPANSION

3

This chapter contains detailed instructions for adding hard-disk and tape drives to Supermicro systems already set up and operating in the field. All of these installations can be performed by one person and require only a few simple tools, as specified.

In performing any of the installation procedures described in this chapter, you should observe the following rules:

- Read and follow the precautions in Sec. 4.1.
- Read the entire procedure before starting it.
- Note that the directions “left” and “right” are in all cases specified as viewed from the rear of the equipment.

3.1 INSTALLING ADD-ON DISK DRIVES

The following sections give step-by-step procedures for adding disk drives to expand the data storage capacities of the Supermicro 8, Supermicro 32, and Supermicro 64.

3.1.1 Supermicro 8 Disk Expansion

The Supermicro 8 (SM8) contains, as standard equipment, one 5¼-inch disk drive providing a data storage capacity of 10 megabytes. The disk capacity of the SM8 can be expanded by installing one or two additional drives in the unit as outlined below.

Under ordinary conditions, an expansion drive can be installed in about 15 minutes.

The tools required are: Phillips-head screwdriver
Slot-head screwdriver
Small razor knife

The installation procedure consists of:

- Removing the existing disk drive assembly from the SM8 cabinet.
- Configuring the add-on drive for its proper address in the system.
- Mounting the add-on drive in the assembly and making the necessary cable connections.
- Replacing the drive assembly in the SM8 cabinet.

To install the expansion drive, do the following:



1. Check the contents of the disk expansion kit. It should include these items:

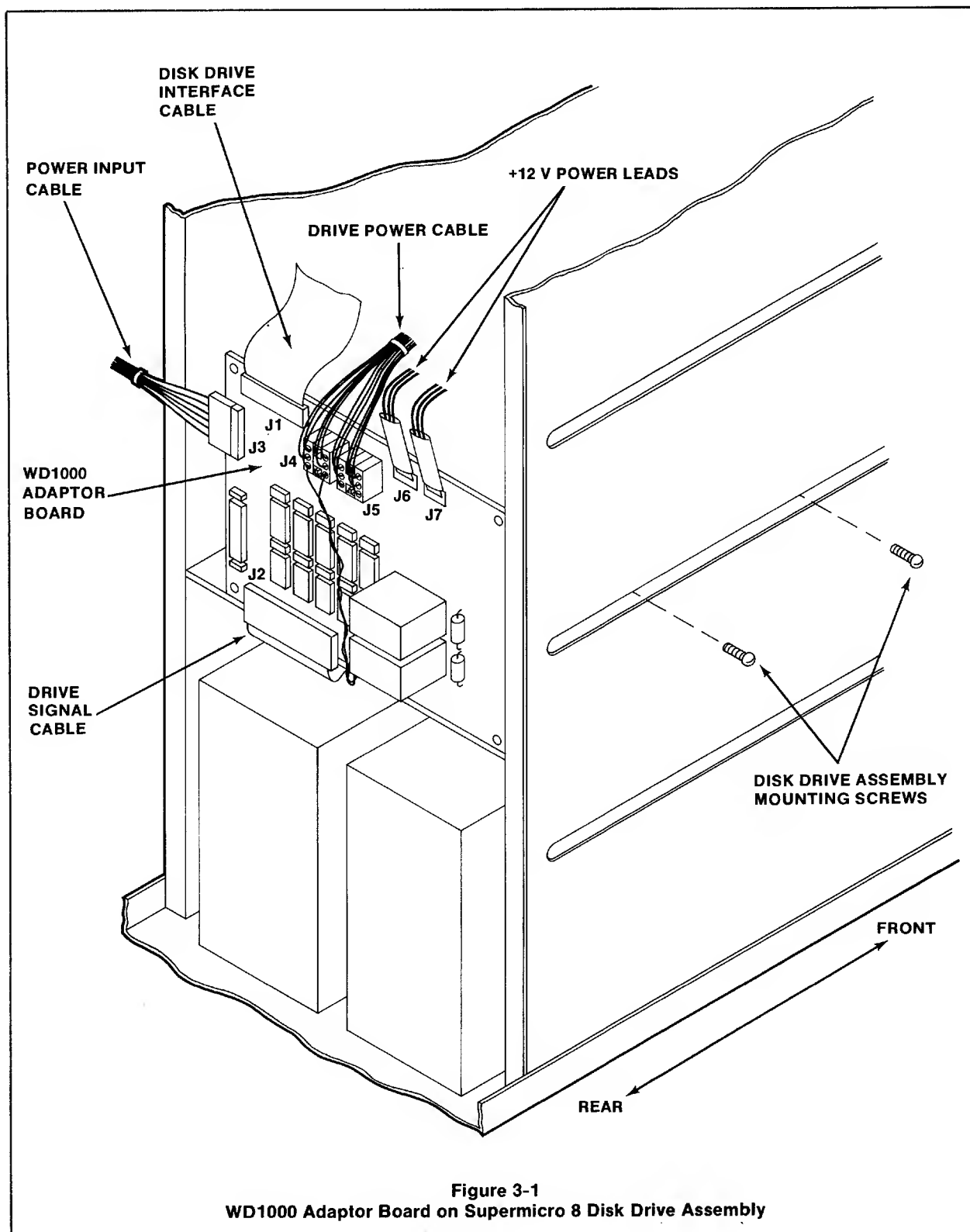
Qty	Item	Molecular Part No.
1	Disk drive, 5¼-inch	81321000
1	Disk data cable	90254021
2	Machine screw, #6-32 × ¼	17132100
2	Star washer, #6	18534001

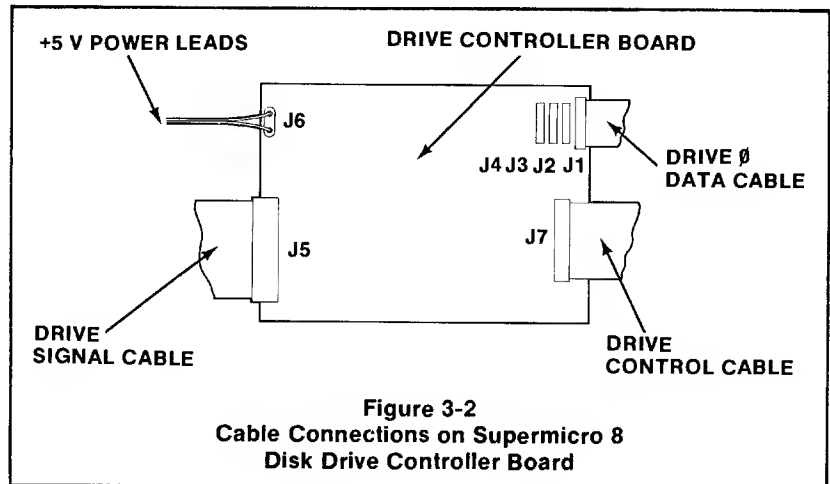
2. Shut the system down (using the DOWN command and the circuit breaker), and remove the power cord from the rear of the unit.
3. Remove both side panels from the cabinet. Four screws hold each panel in place.

NOTE

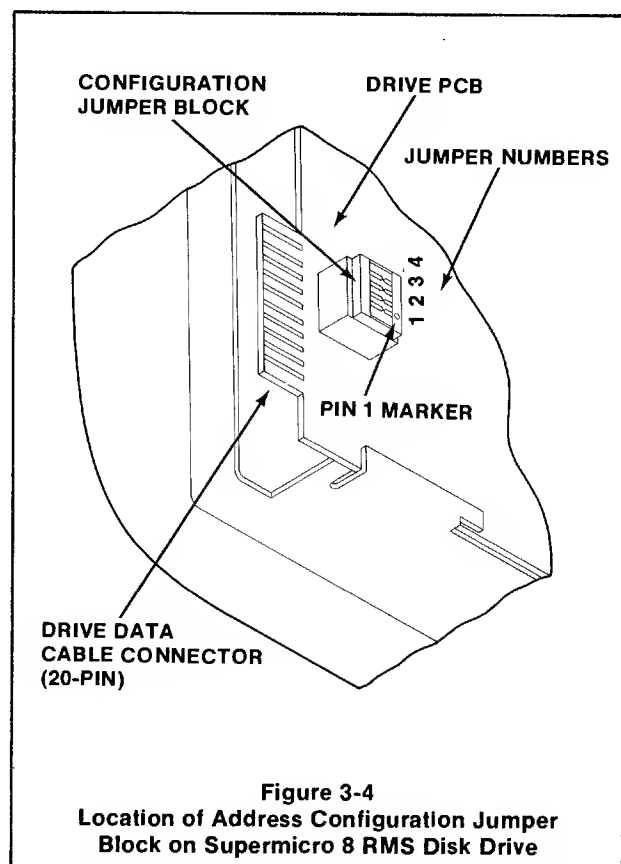
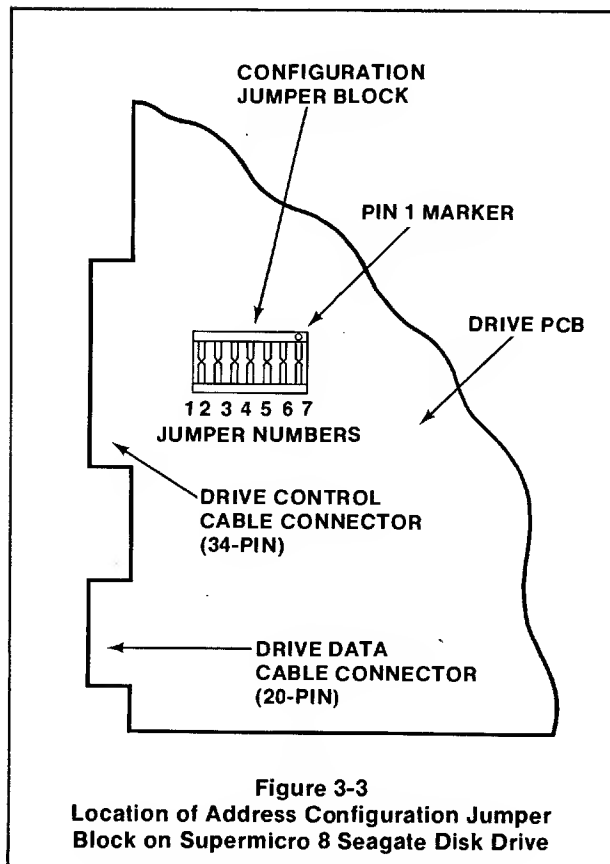
Save all hardware you remove in disassembly. You will need it for reassembly.

4. Remove the lower front cover from the cabinet by removing the two screws that hold the cover in place. You may have to loosen the two screws that hold the upper front cover to free the lower one.
5. Find the WD1000 Adaptor Board at the rear of the disk drive assembly (see Figure 3-1). Reach in and disconnect the following from the adaptor board:
 - ☐ Power input cable (J3)
 - ☐ +12 V power leads (J6 and J7)
 - ☐ Disk drive interface cable (J1)
6. Remove the four mounting screws, two on each side, that hold the disk drive assembly in place. The drive assembly will rest on the power supply below it when the mounting screws are removed.
7. Lift the drive assembly off the power supply and remove it from the front of the cabinet. Be careful not to snag any wires or parts, especially on the controller PCB on the underside of the drive assembly, as you remove the assembly.
8. Set the drive assembly down so that the controller board faces up. Disconnect the following cables from the controller board (see Figure 3-2):
 - ☐ Drive 0 data cable from J1
 - ☐ Drive 1 data cable (if present) from J2
 - ☐ Drive control cable from J7





9. Remove the four nylon screws that hold the controller in place at the corners.
10. Swing the controller board over at the end where the drive signal cable is connected to J5 and lay the board down alongside the drive assembly.
11. Configure the drive being installed as follows:
 - a. Find the address configuration jumper block on the drive PCB. Refer to Figure 3-3 or 3-4, depending on whether you are installing a Seagate drive or an RMS drive. Note from the figure how the jumper straps on the block are numbered.





NOTE

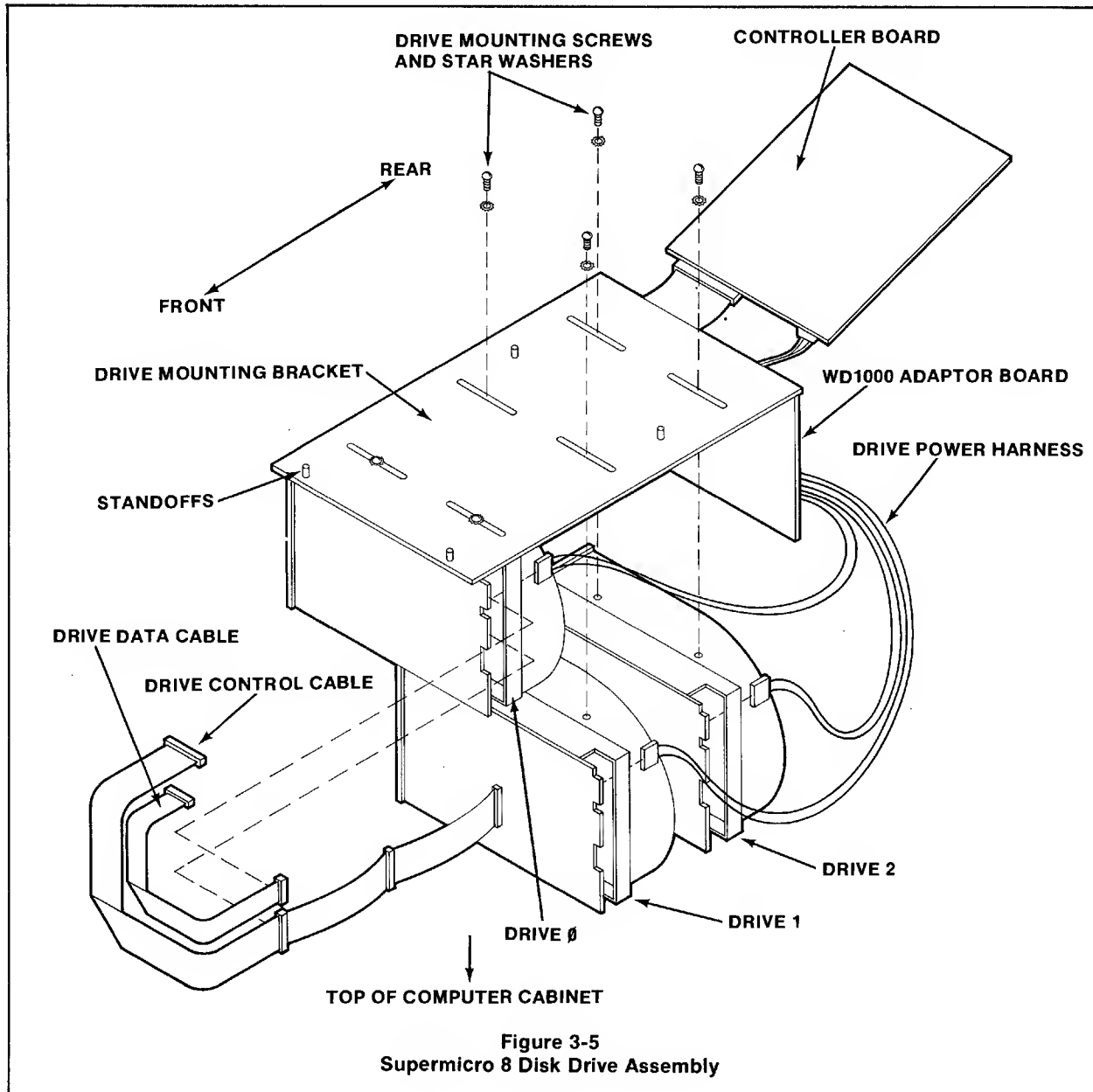
On the Seagate drive, the 7-pin jumper block must be plugged into the 8-pin PCB socket so that pins 1 and 14 on the block mate with pins 2 and 15, respectively, on the socket.

- b. Using a small razor knife, cut through the numbered jumper straps on the block as specified in the table below. Note that the existing drive is number 0, the first add-on drive is number 1, and the second add-on drive is number 2.

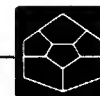
Drive Number	Jumper Straps To Be Cut
1	1, 3, 4
2	1, 2, 4

Make sure you have cut completely through the specified jumpers by seeing that the black surface of the block shows through the cuts.

12. Position the add-on drive in its assigned space under the mounting bracket (see Figure 3-4) so that:
- ☐ The new drive is oriented in the same way as the existing drive(s).
 - ☐ The drive's mounting-screw holes are aligned with the slots in the bracket.
 - ☐ The drive is properly lined up from side to side.
13. Fasten the drive to the mounting bracket with the two star washers and screws supplied.
14. Replace the controller board, component side up, over the standoffs and fasten the board to the standoffs with the four nylon mounting screws.
15. Connect each of the 20-conductor drive data cables as follows:
- a. Connect the drive 0 cable (already connected to the drive) to J1 on the controller board (see Figure 3-2).
 - b. Connect the drive 1 cable to the drive 1 PCB and to J2 on the controller.
 - c. If drive 2 is installed, connect its data cable to the drive PCB and to J3 on the controller.
16. Connect the 34-conductor drive control cable as follows:
- a. Connect one end of the cable to J7 on the controller board.
 - b. Connect each of the daisy-chained connectors near the other end of the cable to the corresponding connector on each drive. If there are only two drives in the assembly, the last cable connector in the chain will hang free.



17. Connect the drive power harness (see Figure 3-5) to the mating connector on each drive.
18. Replace the drive assembly in the computer cabinet with the drives on top and the WD1000 adaptor board toward the rear.
19. Align the drive assembly's mounting-screw holes with the slots in the cabinet's equipment supports. Fasten the assembly in place with the four mounting screws and star washers.



20. Reconnect the cables and leads to the WD1000 adaptor board (Figure 3-1) as follows:
 - Connect the power input cable (orange, 6-pin connector) to J3 so that the black leads are uppermost.
 - Connect the disk drive interface cable (40-conductor ribbon) to J1.
 - Connect the +12 V power leads (black and violet bundles with yellow terminal insulators) to J6 and J7. Attach the black leads to J6 and the violet to J7.
21. Replace the lower front cover on the cabinet and fasten it with the mounting screws. If the screws that hold the upper front cover were loosened, tighten them.
22. Replace both side covers and fasten them with the mounting screws.
23. Connect the AC power cord and power up the system in diagnostic mode (see Installation and User Reference Manual, Sec. 3.4).
24. Format the newly installed expansion drive(s) as described in the Installation and User Reference Manual, Sec. 4.3.

3.1.2 Supermicro 32 Disk Expansion

The Supermicro 32 (SM32) includes, as standard equipment, one 8-inch disk drive providing a data storage capacity of 32 megabytes. The disk capacity of the SM32 can be expanded by installing from one to three additional drives, housed in a separate cabinet, as outlined below.

Under ordinary conditions, the installation can be completed in about 20 minutes.

The tools required are: Phillips-head screwdriver
Slot-head screwdriver
IC extraction tool

The installation procedure consists of:

- Removing the existing disk drive assembly from the SM32 cabinet.
- Removing existing drive connecting cables and replacing them with the ones supplied.
- Removing the terminator board from the existing drive.
- Replacing the drive assembly in the SM32 cabinet.
- Connecting the data and power-control cables between the disk expansion cabinet and the SM32 computer cabinet.

To install the disk expansion unit, do the following:



1. Check the contents of the disk expansion kit. It should include these items:

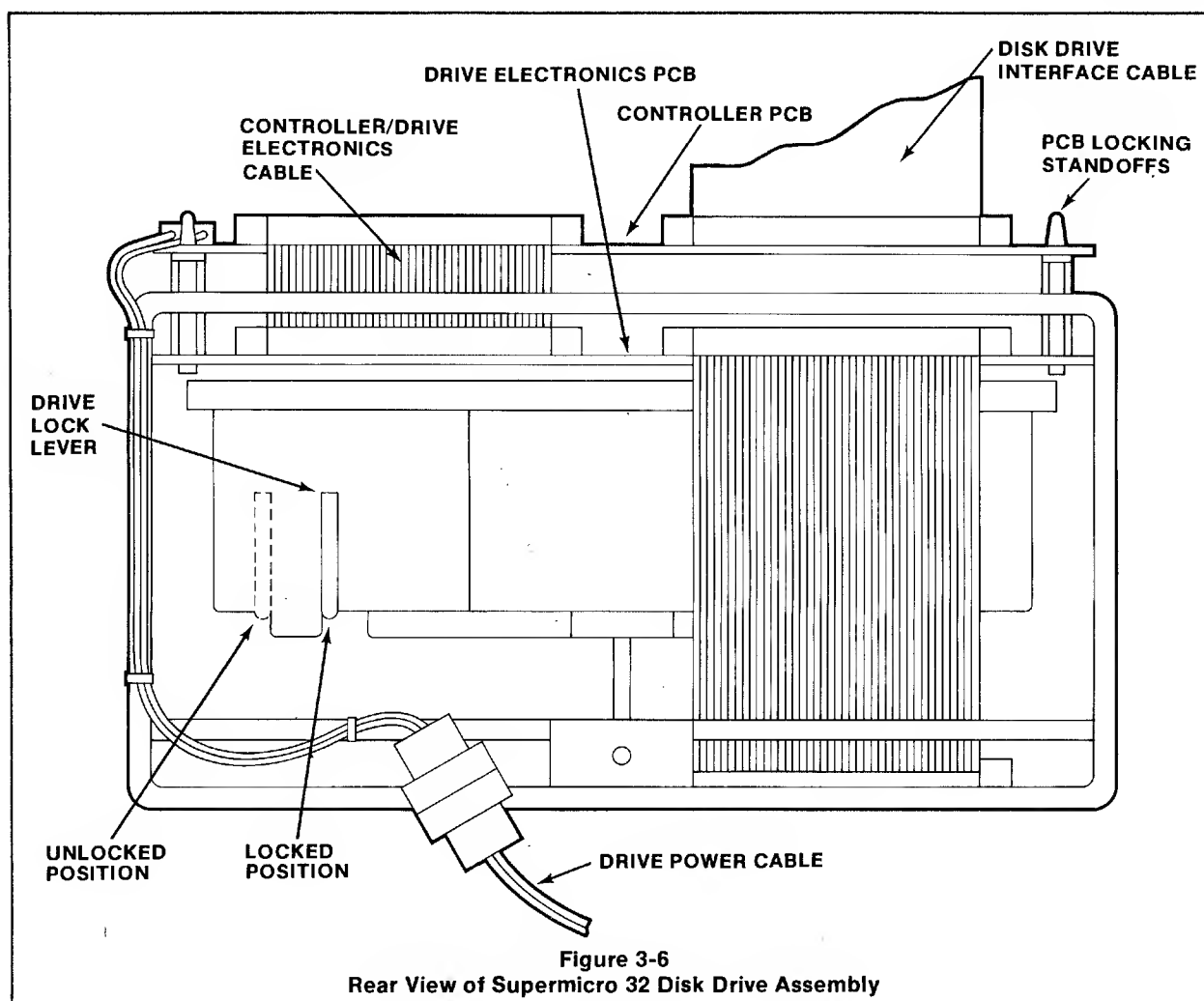
Qty	Item	Molecular Part Number
1	Disk drive expansion unit, 8-inch	98260021
1	AC power cord	82030060
1	Disk data interconnect cable	90264081
1	Power control interconnect cable	90264091
1	Disk drive interface cable (40-conductor)	90264101
1	Controller/drive PCB cable harness	90265001

2. Shut the system down and remove the power cord from the rear of the unit.
3. Remove both side panels from the computer cabinet. Four screws hold each panel in place.

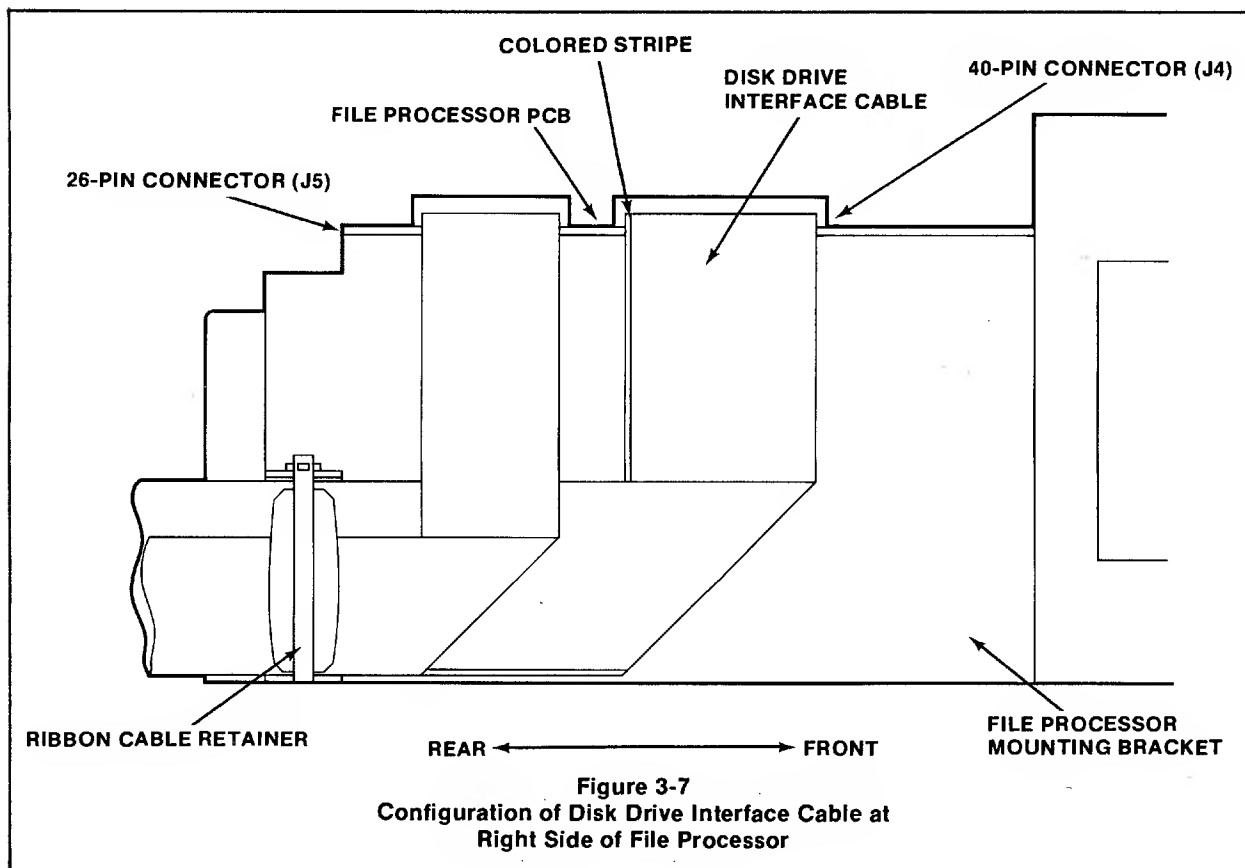
NOTE

Save all mounting hardware you remove in disassembly. You will need it for reassembly.

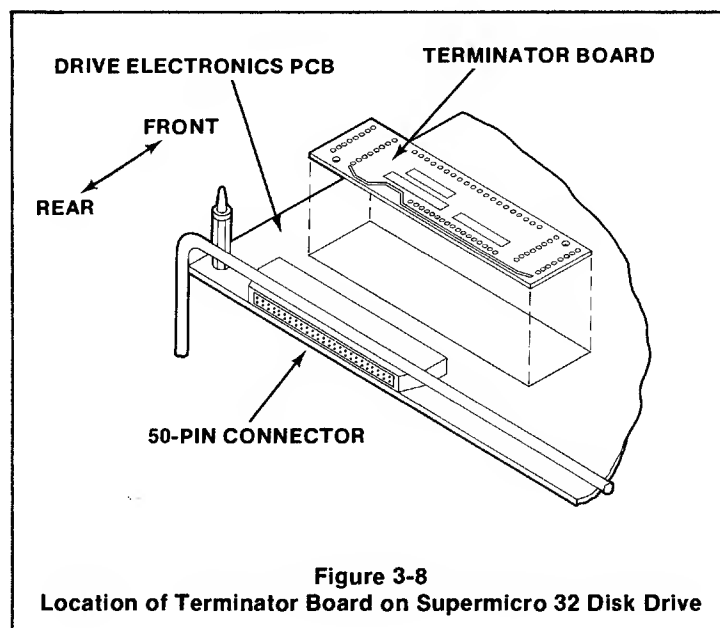
4. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
5. Remove the lower front cover from the cabinet by removing the two screws that hold it in place. You may have to loosen the two screws that hold the upper front cover to free the lower one.
6. Lock the disk drive by moving the lock lever at the left rear of the drive to the "locked" position (see Figure 3-6).
7. Remove the disk drive interface cable as follows:
 - a. Disconnect the cable from the drive controller PCB (Figure 3-6).
 - b. Disconnect the cable from the right side of the file processor (see Figure 3-7).
 - c. Open the ribbon-cable retainer on the file processor mounting bracket and remove the disk drive interface cable. Note how this cable is dressed; you need to know this for a later step.
8. Disconnect the drive power cable at the back of the drive assembly (Figure 3-6).
9. Remove the drive assembly as follows:
 - a. Loosen by about $\frac{1}{2}$ turn the two rear mounting screws, one on each side of the drive assembly.
 - b. While supporting the drive assembly at the front, remove the two front mounting screws.



- c. Slide the assembly forward as far as it will go and gently lower the front end so it rests on the EMI shield below it.
- d. While supporting the rear of the drive assembly, remove the two rear mounting screws. Lift the entire assembly out of the cabinet at the front.
10. Remove the controller/drive electronics cable at the rear of the assembly (Figure 3-6) by disconnecting from the controller and drive electronics PCBs.
11. Connect the controller/drive PCB cable harness supplied as follows:
 - a. Plug the cable-end connector without mounting ears into the 50-pin connector on the controller. The colored stripe on the cable should be at the right.
 - b. Plug the second cable connector without mounting ears into the 50-pin connector on the drive electronics PCB.
12. Remove the controller board from the top of the assembly by unlocking the six locking standoffs that hold the board in place. Swing the board over the back of the assembly and lay it down so the cable harness remains connected.



13. With the IC extraction tool, remove the terminator board from the drive electronics PCB (see Figure 3-8). (The expansion drive contains the terminator.)





14. Replace the controller board on top of the assembly. Make sure all six standoffs are locked and cable connections are secure.
15. Replace the drive assembly in the computer cabinet by reversing the procedure of step 9.

CAUTION

Make sure the hard disk assembly (HDA) of the installed drive is not shorting to the computer cabinet frame. Check to see that the resistance between the HDA and frame (with all terminals and printers disconnected from the computer) is at least 10k ohms. Anything less may produce intermittent BDOS errors.

16. Install the disk drive interface cable supplied as follows:
 - a. Connect one end of the cable to the 40-pin connector on the drive controller board (Figure 3-6). The colored stripe on the cable should be at the right.
 - b. Connect the other end of the cable to J4 on the file processor (Figure 3-7) with the colored stripe toward the rear of the system.
 - c. Dress the cable through the ribbon-cable retainer on the file processor mounting bracket in the same way as the cable removed in step 7c.
17. Reconnect the drive power cable to the drive assembly (Figure 3-6).
18. Mount the controller/drive PCB cable harness to the rear panel of the computer cabinet as follows (see Figure 3-9):
 - a. Remove the plate that covers the rectangular connector opening in the rear panel.
 - b. Dress the free end of the cable harness up through the cable relief opening and over to the rear panel.
 - c. Fit the cable connector into the panel opening with the colored stripe on the cable toward the top. Fasten the connector to the panel with the hardware removed in step a.
19. Unlock the disk drive by moving the lock lever to the "unlocked" position (Figure 3-6).
20. Replace the top cover on the cabinet and fasten it with the mounting screws.

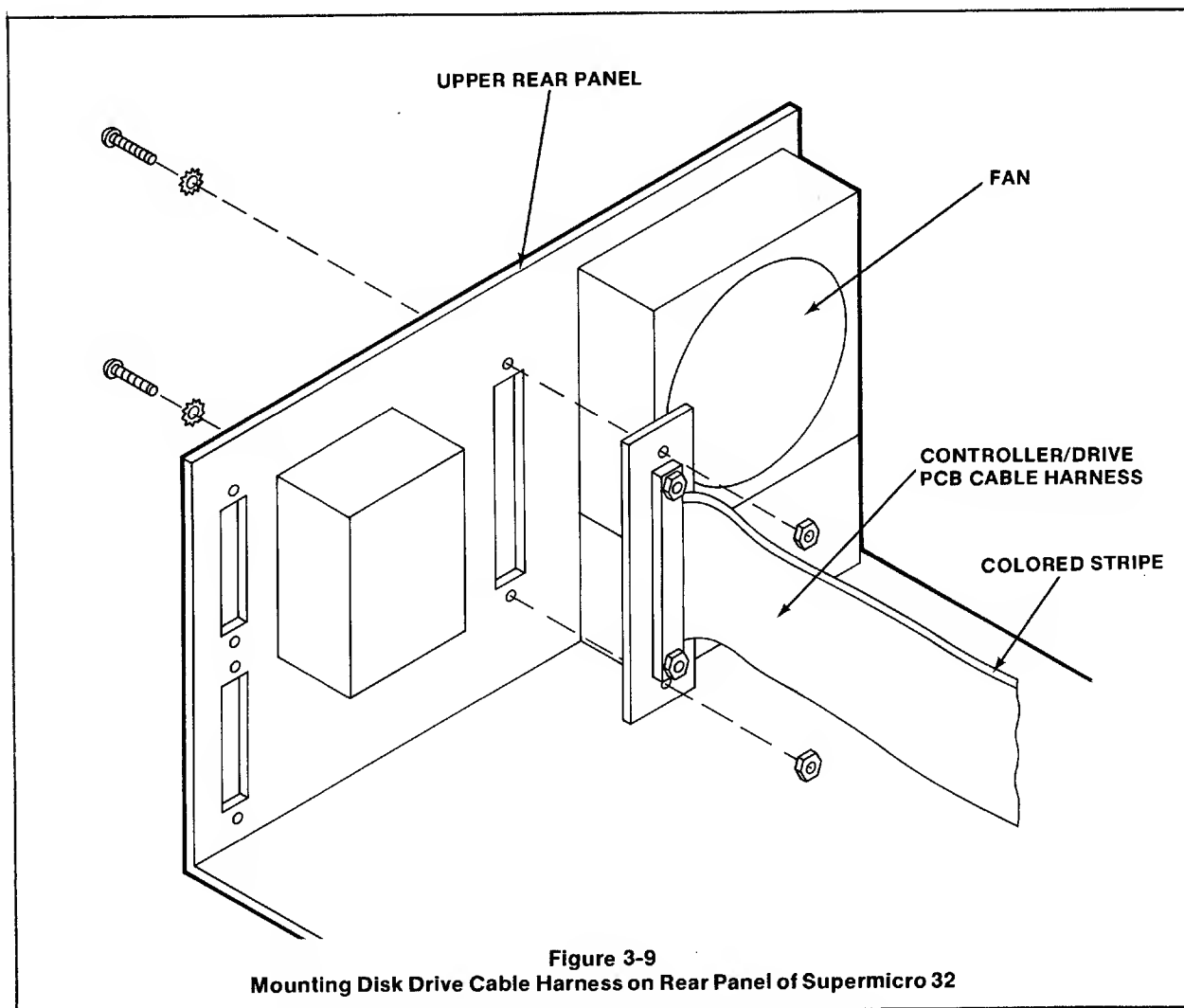


Figure 3-9
Mounting Disk Drive Cable Harness on Rear Panel of Supermicro 32

21. Replace the lower front cover and fasten it with the mounting screws. If the screws that hold the upper front cover were loosened, tighten them.
22. Replace both side panels and fasten them with the mounting screws.
23. Unlock the disk drive in the disk-expansion unit:
 - a. Remove the left side panel from the expansion cabinet.
 - b. Move the drive lock lever at the rear of the drive to the "unlocked" position.
 - c. Replace the left side panel and fasten it with the mounting screws.
24. Interconnect the disk expansion unit and the computer as follows:
 - a. Plug the disk data interconnect cable supplied into the 50-pin connector on the upper rear panel of each cabinet. The colored stripe on the cable should be at the top.
 - b. Plug the power-control interconnect cable supplied into the mating connector on the upper rear panel of each cabinet.



25. Connect the AC power cords to both units and power up the system in diagnostic mode (see Installation and User Reference Manual, Sec. 3.4).
26. Format the newly installed expansion drive as described in the Installation and User Reference Manual, Sec. 4.3.

3.1.3 Supermicro 64 Disk Expansion

(Information not yet available)

3.2 INSTALLING STREAMER TAPE DRIVES

The following sections give step-by-step procedures for adding a streamer tape drive assembly to the Supermicro 8, Supermicro 32, and Supermicro 64.

3.2.1 Supermicro 8 and Supermicro 32 Tape Drive Installation

The procedures for installing a tape drive in the SM8 and the SM32 are identical. Under ordinary conditions, the drive can be installed in about 15 minutes.

The only tool required is a Phillips-head screwdriver.

The installation procedure consists of:

- ☐ Mounting the tape drive assembly in the computer cabinet.
- ☐ Connecting the drive interface and power cables.
- ☐ Replacing a solid front-panel section of the computer cabinet with a bezel for tape cartridge insertion.

To install the tape drive, do the following:

1. Check the contents of the drive installation kit. It should contain these items:

Qty	Item	Molecular Part Number
1	Tape drive	81370000
1	Tape drive interface cable	90234051
1	Bezel	16000011
4	Machine screw, #8-32 \times $\frac{3}{8}$	17124201
4	Star washer, #8	18554000

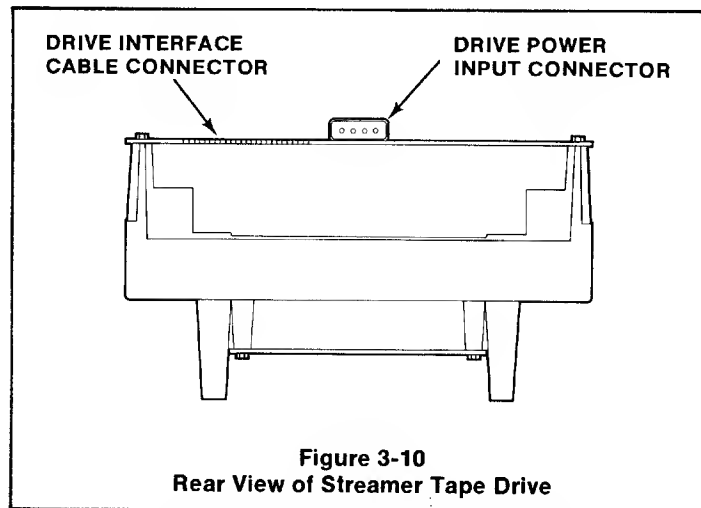
2. Shut the system down and remove the power cord from the rear of the unit.
3. Remove both side panels from the computer cabinet. Four screws hold each panel in place.



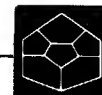
NOTE

Save all mounting hardware you remove in disassembly. You will need it for reassembly.

4. Remove the lower front cover from the cabinet by removing the two screws that hold it in place. You may have to loosen the two screws that hold the upper front cover in order to free the lower one.
5. Remove the solid panel section near the top of the lower front cover and replace it with the bezel supplied.
6. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
7. Connect the tape drive interface cable supplied to the 50-pin PCB edge connector at the rear of the drive (see Figure 3-10). The colored stripe should be at the left with the cable coming out the bottom of its connector.



8. Mount the tape drive inside the computer cabinet as follows:
 - a. Orient the drive assembly so its legs point down and the tape cartridge opening is at the front.
 - b. Position the drive assembly in its assigned space inside the cabinet (see Installation and Maintenance Manual Figure 2-2) so that the mounting nuts in the sides of the drive are aligned with the mounting slots in the cabinet's equipment supports.
 - c. Fasten the drive to the supports with the four machine screws and star washers supplied.
9. Run the free end of the drive interface cable up to the file processor and plug it into the 50-pin connector (J7) at the rear of the file processor. The colored stripe at this point should be on the right.
10. Connect the tape drive power cable to the mating 4-pin connector at the rear of the drive (see Figure 3-10).



11. Replace the top cover on the cabinet and fasten it with the mounting screws.
12. Replace the lower front cover and fasten it with the mounting screws. If the screws that hold the upper front cover were loosened, tighten them.
13. Replace both side panels and fasten them with the mounting screws.
14. Connect the AC power cord and turn on the system (see Installation and User Reference Manual, Sec. 3.3).

3.2.2 Supermicro 64 Tape Drive Installation

The tape drive for the Supermicro 64 is housed in a separate cabinet. Under ordinary conditions, the installation can be completed in about 10 minutes.

The tools required are: Phillips-head screwdriver
Slot-head screwdriver

The installation consists of:

- ☐ Opening the cabinet of the tape drive unit to retrieve the interconnect cables and power cord.
- ☐ Connecting the leads at one end of the power control interconnect cable to the computer power supply, and connecting the other end of the cable to the tape drive unit.
- ☐ Connecting the tape data interconnect cable between the SM64 file processor and the tape drive unit. To install the tape drive unit, do the following:
 1. Remove both side panels from the tape drive cabinet. Four screws hold each panel in place.

NOTE

Save all mounting hardware you remove in disassembly. You will need it for reassembly.

2. Remove the lower rear panel from the tape drive cabinet by removing the two screws that hold the panel in place.
3. Remove the following items from inside the rear of the cabinet:

Qty	Item	Molecular Part Number
1	Tape data interconnect cable	90234010
1	Power control interconnect cable	82030060
1	AC power cord	82030060

4. Shut the SM64 system down and remove the power cord from the rear of the computer cabinet.

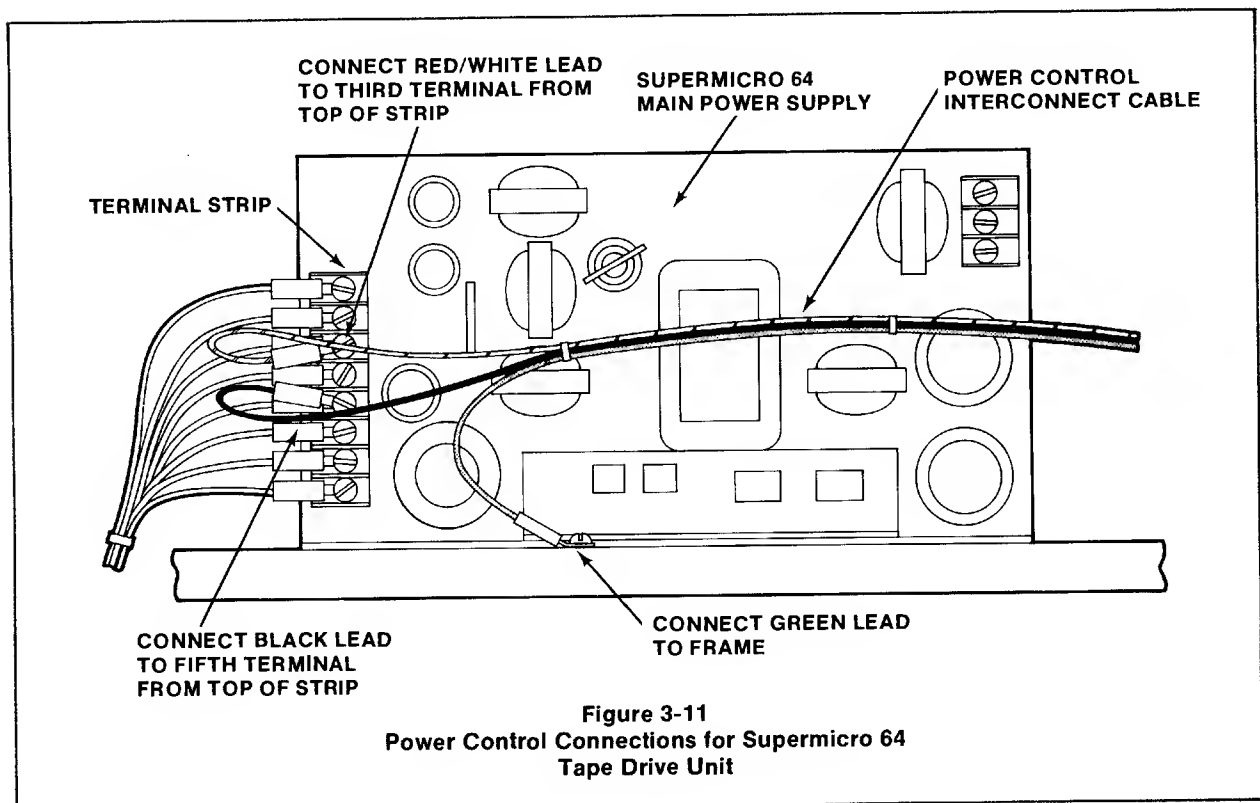


5. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
6. Take the top cover off the computer cabinet by removing the four screws that hold the cover in place.
7. Remove the lower rear panel from the computer cabinet by removing the two screws that hold the panel in place.
8. Locate the main power supply in the computer cabinet (see Installation and User Reference Manual Figure 2-3) and connect the three leads at one end of the power control interconnect cable as follows (see Figure 3-11):

NOTE

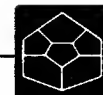
The information in a, b, and c below applies only to the Todd MOS100-2412 power supply.

- a. Connect the red/white lead to the third terminal from the top on the supply's terminal strip.
- b. Connect the black lead to the fifth terminal from the top on the same strip.
- c. Connect the green lead to the frame. Use the screw that holds the disk drive mounting bracket.





9. Run the power control interconnect cable neatly down to the bottom of the cabinet and out the back.
10. Plug the single-connector end of the tape data interconnect cable into the 50-pin connector on the left rear of the file processor.
11. Run the tape data interconnect cable neatly down to the bottom of the cabinet and out the back along with the power control cable.
12. Replace the top cover as well as the side and rear panels on the computer cabinet and fasten them with the mounting screws.
13. Connect the free end of the power control interconnect cable to the mating connector at the bottom rear inside the tape drive cabinet.
14. Replace the side and rear panels on the tape drive cabinet and fasten them with the mounting hardware.
15. Plug the free end of the tape data interconnect cable into the two 25-pin D connectors on the upper rear panel of the tape drive cabinet. The colored stripe should be at the top of the upper connector.
16. Connect the AC power cords to both units and power up the system (see Installation and User Reference Manual, Sec. 3.3).



CORRECTIVE MAINTENANCE 4

Corrective maintenance for the Supermicro system consists of troubleshooting the system to isolate a fault to a field replaceable part (see Table 4-1) and replacing the faulty item with a properly functioning one if the fault cannot be readily repaired in the field. This chapter includes troubleshooting information to help in localizing faults and detailed procedures for removing and replacing faulty parts of the system. The chapter also outlines a number of precautions designed to help prevent accidental damage to the equipment during maintenance.

A log should be kept of inspections, faults, and repairs for each Supermicro system serviced. Such a record can be a valuable aid to proper maintenance.

4.1 SERVICING PRECAUTIONS

In servicing the equipment, observe the following precautions:

- Handle the printed circuit boards (PCBs) in such a way as to avoid possible damage to components by static discharge. Always place one hand on the computer chassis, or the surface on which the board rests, before touching the board with the other hand. Always handle the board by its outer edges and, where necessary, support it from the printed-circuit side.
- When you replace an application processor in the computer, make sure it is firmly seated in the card cage. Be careful of pin alignment when installing cards—**Don't force them!**
- Use care when you unplug cables from connectors mounted on a PCB, especially IC socket type connectors. If necessary, use an IC extraction tool or carefully pry the plug up from both ends with a small screwdriver. Never pull on the cable itself.
- When you reconnect a cable to a PCB, make sure the pin numbers on the plug and mating socket correspond (if, the connectors are not keyed). Make sure all pins are engaged (watch for offset) and be careful not to bend any pins on the male connector.

TABLE 4-1 - FIELD REPLACEABLE PARTS

Item	Molecular Part No.
Diskette drive assembly, SM8/SM32	81321010
Diskette drive assembly, SM64	81320001
Hard-disk drive, 5¼-inch, SM8	81321000
Disk drive controller, SM8	90252000
Hard-disk drive, 8-inch, SM32	81320080
WD1000 adaptor, SM8	90252011
Disk drive controller, SM32	81462000



Hard-disk drive assembly, SM64	90248071
Tape drive assembly	81370000
File processor	90242002
Application processor, 8001	90242021
Power supply, +24 V, SM8/SM32	81430040
Power supply, -12 V, SM8	81430050
Power supply, +12 V, SM8	81430060
Power supply, +5 V, SM8	81430030
Power supply, +/-5 V and +/-12 V, SM32	81430150
Power supply, main, SM64	81430120
Power supply, +5 V, SM64	81430010

4.2 TROUBLESHOOTING

The troubleshooting information provided below is intended to help you isolate a fault to a field replaceable part (Table 4-1). In general, this category of parts includes plug-in circuit cards (application processors) and other plug-connected units, modules, or assemblies. Also included, however, are several assemblies (DC power supplies) that require the use of a soldering iron for removal and replacement. Figures 2-2 and 2-3 in the Installation and User Reference Manual show where the various items are located in the computer cabinet.

The paragraphs that follow provide some procedural guidelines for fault isolation and describe the diagnostic programs available for this purpose. Note, however, that successful troubleshooting depends to a great extent on a good understanding of how the system and its component parts work. Such an understanding can be gained by a conscientious reading of all the manuals and other technical documents covering the system and by experience with the system itself.

4.2.1 General Troubleshooting Procedure

As a first step, determine whether the trouble indication points to a software problem or to a fault in the hardware. Most operating problems are due to software or operator errors. Make sure, also, that the problem does not lie in the peripheral equipment (terminals, printers, modems, etc.).

Having established that the fault is in the computer, use the diagnostic programs described in Sec. 4.4.4, as appropriate, to narrow down the possibilities. Consider all indications and symptoms together rather than individually. Also take note of the system's overall behavior patterns, including functions correctly executed. Be aware of possible temperature effects when trying to isolate an intermittent problem.

After localizing the trouble to a replaceable unit, confirm that the suspected item is faulty. The simplest way to do this in the case of an application processor card is to substitute a spare known to be good. If no spares are available, and in the case of other equipment



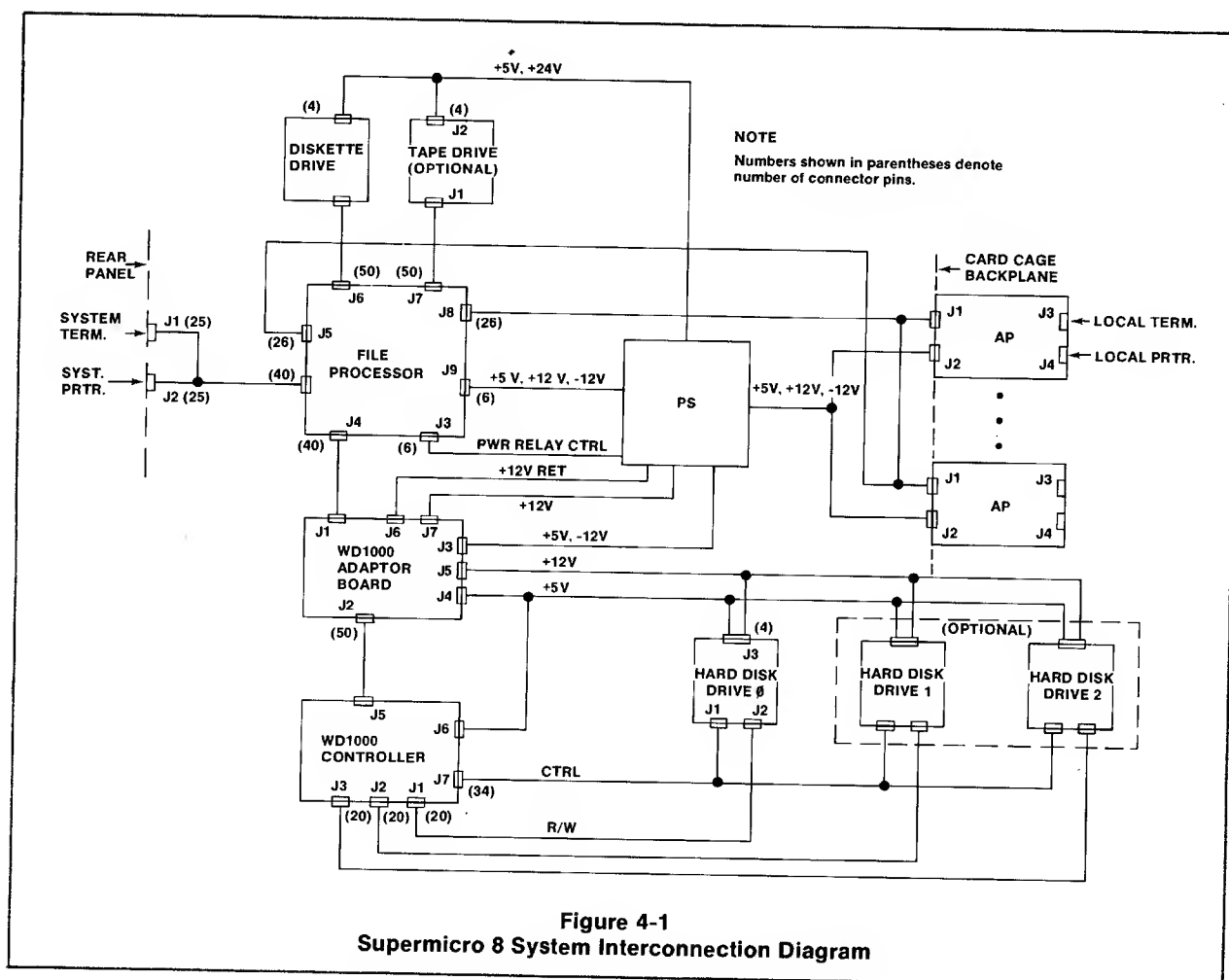
items, use test instruments to check for proper signal activity at appropriate test points or connector pins. Refer to the system interconnection diagram (Figure 4-1, 4-2, or 4-3), the system schematic diagrams (Chapter 5), and the file processor signal pin assignments shown in table 2-1. Also refer to the theory and maintenance sections of the vendor equipment manuals (see Appendix A).

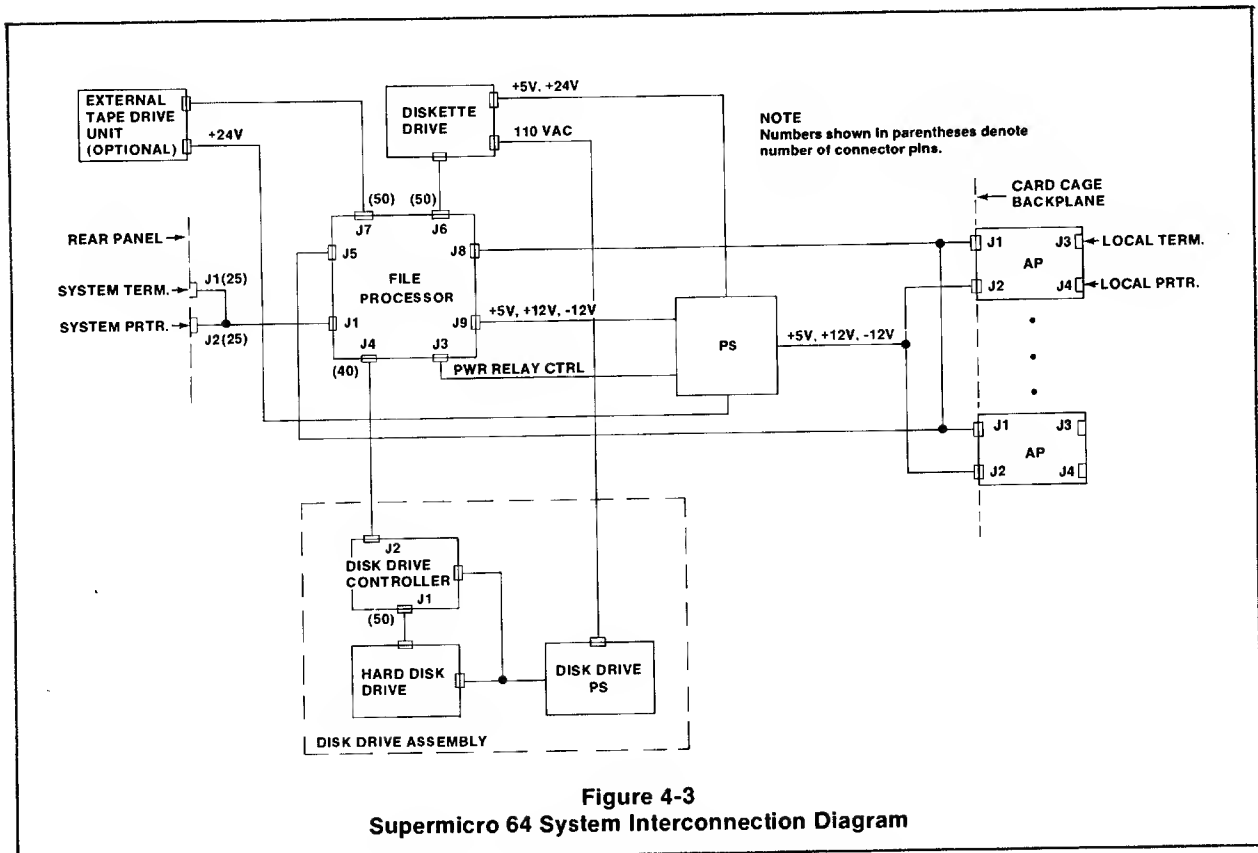
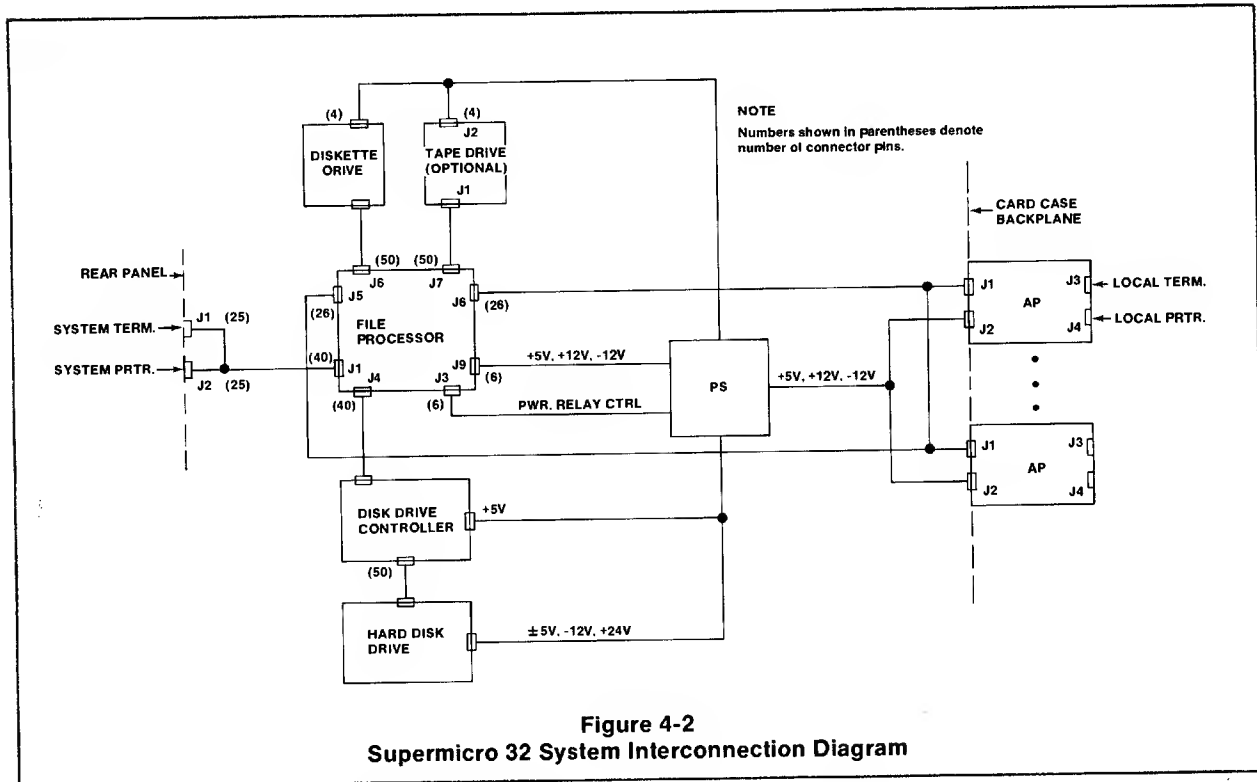
Note that the system input and bus output lines have the following logic levels:

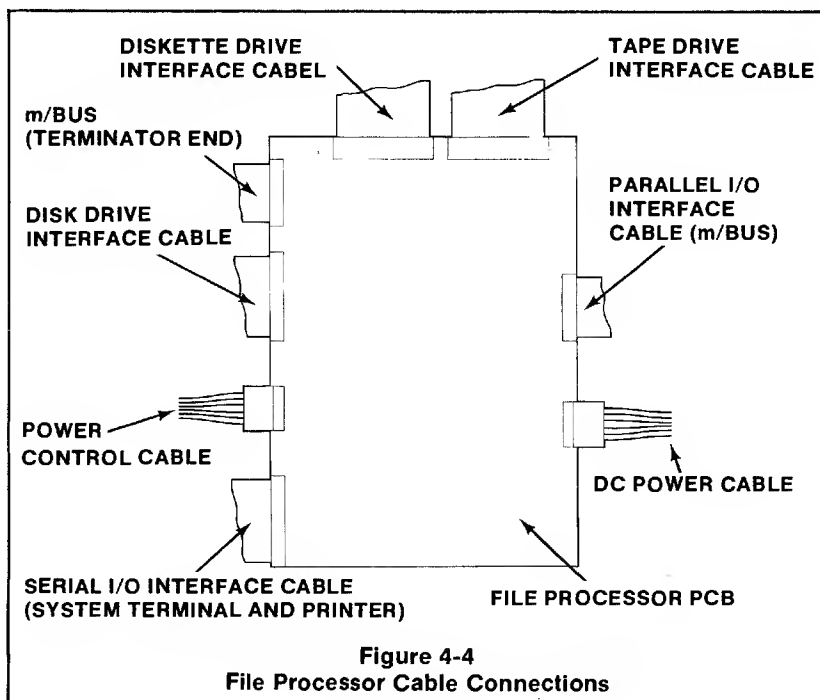
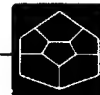
Active (low/true): 0 VDC to +0.4 VDC

Inactive (high/false): +2.5 VDC to +4 VDC

Check the DC supply outputs, as necessary, for correct voltage levels and absence of drift. The easiest place to check DC power line levels is at the pins of connectors J3 and J9 on the file processor (see Figure 4-4 and Table 2-1).







4.2.2 Diagnostics

The Supermicro distribution/diagnostic diskette contains a number of system utilities and test programs that can help you detect and isolate troubles in the system. Each of these programs is described below.

DKM - This utility formats and verifies diskettes and is useful in checking diskette drive operation. DKM can be implemented only in diagnostic mode as described in the Installation and User Reference Manual, Sec. 4.2.

SYSINT - This utility formats, verifies, and configures the hard disk and is useful in checking the operation of the disk drive unit. An intermittent error obtained with this program usually indicates that the disk drive controller is faulty. SYSINT can be operated only in diagnostic mode as described in the Installation and User Reference Manual, Sec. 4.3.

TAPE - This utility is used for tape backup operation and can serve to check the part of the system that is involved in transferring data between disk and tape. To implement the TAPE program, see Sec. 5.4 in the Installation and User Reference Manual.

DSD - This diagnostic program repeatedly transfers data back and forth between the file processor and each application processor in the system. It thus checks the integrity of interprocessor communications for the entire system. The program also serves as a gross test of the file processor RAM. DSD operates in diagnostic mode as described in Appendix B.

GPMON - This program tests both user-selected portions of the file processor memory and individual ports in the file processor or any application processor. The program provides 10 selectable test operations and is implemented in diagnostic mode as described in Appendix C.



4.3 ASSEMBLY REMOVAL AND REPLACEMENT PROCEDURES

The following paragraphs provide step-by-step procedures for removing and replacing the field-replaceable parts in the Supermicro computer (see Table 4-1).

In performing any of these procedures, you should observe the following rules:

- ☐ Read and follow the precautions in Sec. 4.1
- ☐ Read the entire procedure before starting it.
- ☐ Note that the directions "left" and "right" are in all cases specified as viewed from the rear of the equipment.
- ☐ Save all mounting hardware you remove in disassembly so you can use it as necessary in reassembly.

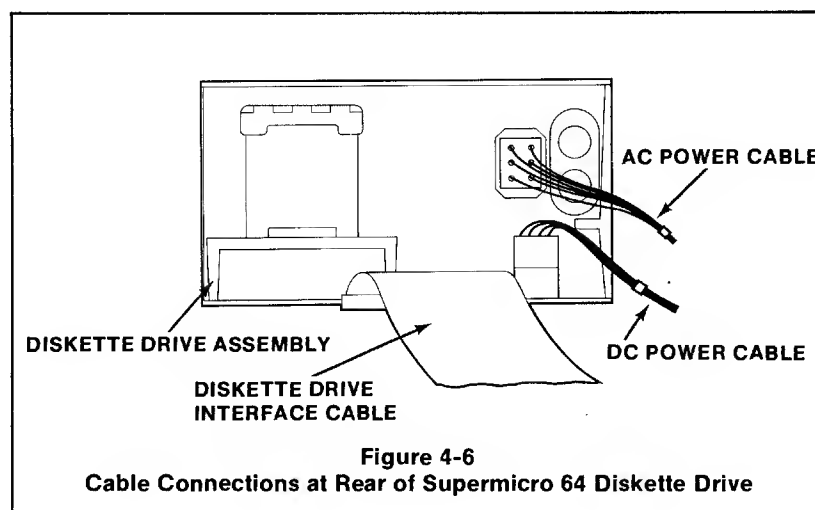
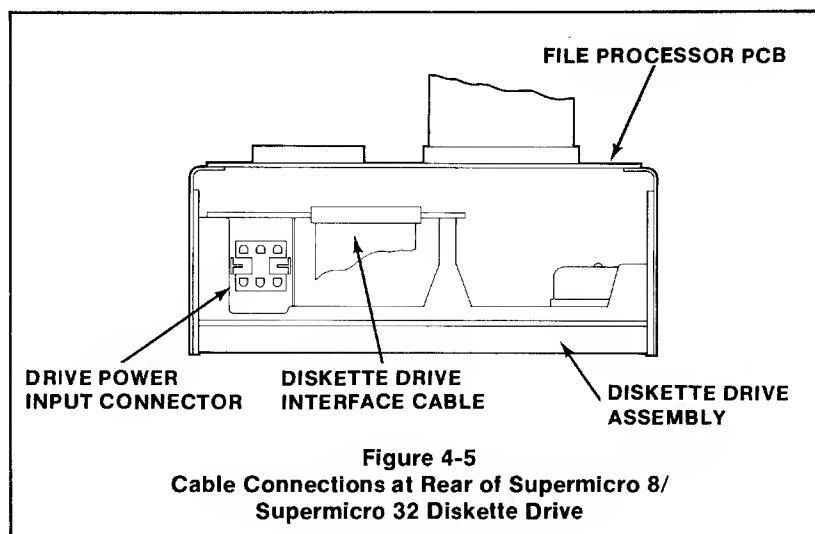
The tools needed to perform all of the removal and replacement procedures are:

- ☐ Phillips-head screwdriver
- ☐ Slot-head screwdriver
- ☐ IC extraction tool

4.3.1 Diskette Drive Assembly

The following procedure covers the removal and replacement of the diskette drive assembly on the Supermicro 8, Supermicro 32, or Supermicro 64.

1. Shut the system down and remove the power cord from the rear of the unit.
2. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
3. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
4. Remove the upper front cover from the cabinet by removing the two screws that hold the cover in place. Note that on the Supermicro 8 or Supermicro 32, you must also disconnect the leads to the power-on switch before you can remove the cover completely.
5. At the rear of the drive, disconnect the following cables:
 - ☐ On the Supermicro 8 or Supermicro 32, disconnect the diskette drive interface cable and the drive power cable (see Figure 4-5).
 - ☐ On the Supermicro 64, disconnect the drive interface cable, AC power cable, and DC power cable (see Figure 4-6).
6. While supporting the drive assembly from underneath, remove the four screws, two on each side, that hold the assembly in place. Remove the drive assembly from the front of the cabinet. Be careful not to snag any wires or components.



To replace the diskette drive assembly, reverse the above procedure and observe the following:

- Mount the assembly in the computer cabinet as far forward as the mounting slots at the sides will allow.
- On the Supermicro 8 or Supermicro 32, be careful not to pinch the power-on switch wiring when you replace the upper front cover on the cabinet.

4.3.2 Disk Drive Assembly, Supermicro 8

The following procedure covers the removal and replacement of a disk drive, the drive controller, or the WD1000 adaptor board on the Supermicro 8.

1. Shut the system down and remove the power cord from the rear of the unit.
2. Remove both side panels from the cabinet. Four screws hold each panel in place.



3. Remove the lower front cover from the cabinet by removing the two screws that hold the cover in place. You may have to loosen the two screws that hold the upper front cover to free the lower one.
 4. Find the WD1000 adaptor board at the rear of the disk drive assembly (see Figure 3-1). Reach in and disconnect the following from the adaptor board:
 - Power input cable (J3)
 - +12 V power leads (J6 and J7)
 - Disk drive interface cable (J1)
 5. Remove the four mounting screws, two on each side, that hold the disk drive assembly in place. The drive assembly will rest on the power supply below it when the mounting screws are removed.
 6. Lift the drive assembly off the power supply and remove it from the front of the cabinet. Be careful not to snag any wires or parts, especially on the controller PCB on the underside of the drive assembly, as you remove the drive assembly.
 7. If you are replacing the WD1000 adaptor board, perform steps a, b, and c below, otherwise skip to step 8.
 - a. Disconnect the drive signal cable from J2 on the adaptor board (Figure 3-1).
 - b. Disconnect the drive power cable from J4 and J5 on the adaptor board.
 - c. Remove the four screws that hold the adaptor board to the drive mounting bracket.
 8. Turn the drive assembly over so that the controller board faces up. Disconnect the following cables from the controller board (see Figure 3-2):
 - Drive 0 data cable from J1
 - Drive 1 data cable (if present) from J2
 - Drive 2 data cable (if present) from J3
 - Drive control cable from J7
- If you are replacing the controller board, also disconnect the drive signal cable from J5 and the +5 V power leads from J6. If you are not replacing the controller, leave these two connections intact and go to step 9.
9. Remove the four nylon screws that hold the controller in place at the corners.
 10. Swing the controller board over at the end where the drive signal cable is connected to J5 and lay the board down alongside the drive assembly.
 11. Disconnect the drive data cable and drive control cable from the faulty drive (see Figure 4-4).
 12. Remove the two screws and star washers that hold the drive to the mounting bracket.
 13. With the IC extraction tool, remove the address configuration jumper block from the PCB on the faulty drive (see Figure 3-3 or 3-4). Replace the jumper block on the new drive with the one removed from the old drive. Make sure the block is installed with the correct orientation.



NOTE

On the Seagate drive, the 7-pin jumper block must be plugged into the 8-pin PCB socket so that pins 1 and 14 on the block mate with pins 2 and 15, respectively, on the socket.

14. Install the new drive in the drive assembly and replace the assembly in the computer cabinet by reversing the procedure of steps 1 through 12 above.
15. Power up the system in diagnostic mode (see Installation and User Reference Manual, Sec. 3.4) and format the newly installed drive as described in the Installation and User Reference Manual, Sec. 4.3.

4.3.3 Disk Drive Assembly, Supermicro 32

The following procedure covers the removal and replacement of the disk drive or drive controller on the Supermicro 32.

1. Shut the system down and remove the power cord from the rear of the unit.
2. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
3. Remove the lower front cover from the cabinet by removing the two screws that hold it in place. You may have to loosen the two screws that hold the upper front cover to free the lower one.
4. Lock the disk drive by moving the lock lever at the left rear of the drive to the "locked" position (see Figure 3-6).
5. Disconnect the disk drive interface cable from the controller PCB (Figure 3-6). Disconnect the drive power cable at the rear of the assembly. (If the system includes an expansion disk unit, also disconnect the ribbon cable harness at the left rear of the controller and drive electronics PCBs.)
6. Remove the drive assembly from the computer cabinet as follows:
 - a. Loosen by about $\frac{1}{2}$ turn the two rear mounting screws, one on each side, of the drive assembly.
 - b. While supporting the drive assembly at the front, remove the two front mounting screws.
 - c. Slide the assembly forward as far as it will go and gently lower the front end so it rests on the EMI shield below it.
 - d. While supporting the rear of the drive assembly, remove the two rear mounting screws. Lift the entire assembly out of the cabinet at the front.



7. Remove the drive controller/electronics cable at the rear of the assembly (Figure 3-6) by disconnecting from the controller and drive electronics PCBs.
8. Disconnect the DC power cable (2-pin connector) from the controller PCB.
9. Remove the controller board from the top of the assembly by unlocking the six locking standoffs that hold the board in place.
10. Reinstall the controller board and replace the drive assembly in the computer by reversing the procedure of steps 1 through 8 above.

NOTE

Make sure the head disk assembly (HDA) of the installed drive is not shorting to the computer cabinet frame. Check to see that the resistance between HDA and frame (with all terminals and printers disconnected from the computer) is at least 10k ohms. Anything less may produce intermittent BDOS errors.

11. Power up the system in diagnostic mode (see Installation and User Reference Manual, Sec. 3.4) and format the newly installed drive as described in the Installation and User Reference Manual, Sec. 4.3.

4.3.4 Disk Drive Assembly, Supermicro 64

The procedure outlined below covers the removal and replacement of the entire disk drive assembly on the Supermicro 64.

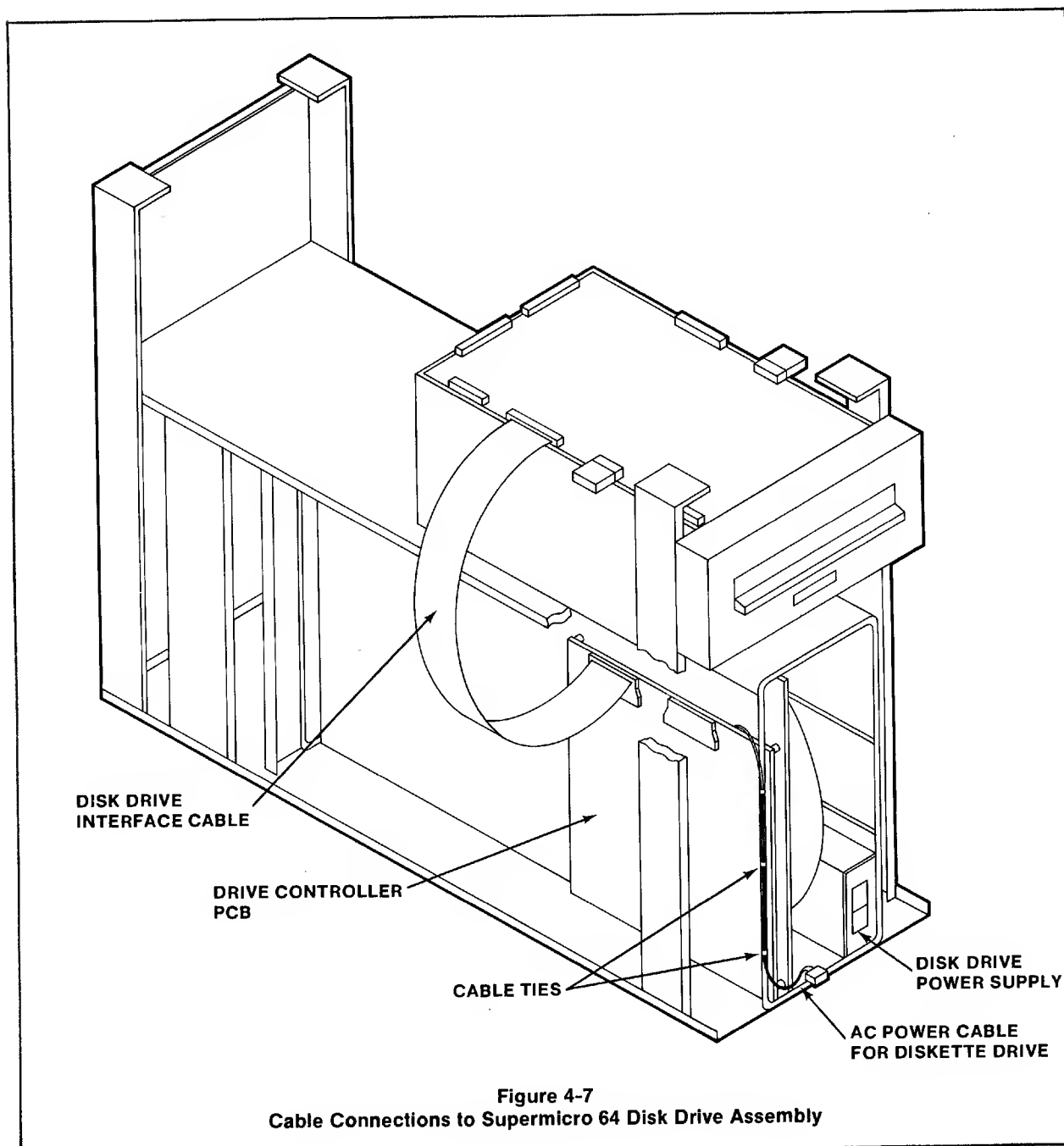
1. Shut the system down and remove the power cord from the rear of the unit.
2. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
3. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
4. Loosen the two screws that hold the upper front cover in place and remove the two screws that hold the lower front cover. Gently pull the lower cover away from the cabinet so you can reach in and disconnect the leads to the front panel power-on switch.
5. Lock the disk drive by moving both the spindle lock lever and the carriage lock lever on the left side of the drive to the "locked" position (see Installation and User Reference Manual, Figure 2-6).
6. On the right side of the drive assembly, disconnect the disk drive interface cable from the drive controller PCB (see Figure 4-7).
7. At the front of the drive assembly, disconnect the AC power cable for the diskette drive from the disk drive power supply. Cut the cable ties that hold the AC power cable to the frame of the disk drive assembly.
8. At the left side of the drive assembly, cut the cable ties that hold the computer's DC power harness to the frame of the disk drive assembly.



9. Stand the computer up on a table and remove the four screws that hold the drive assembly mounting brackets to the top shelf of the computer cabinet (see Figure 4-8).

NOTE

If there is no one to assist, you may find it more convenient to lay the computer down on its left side, placing a large telephone book under the disk drive to support it when the mounting screws are removed.



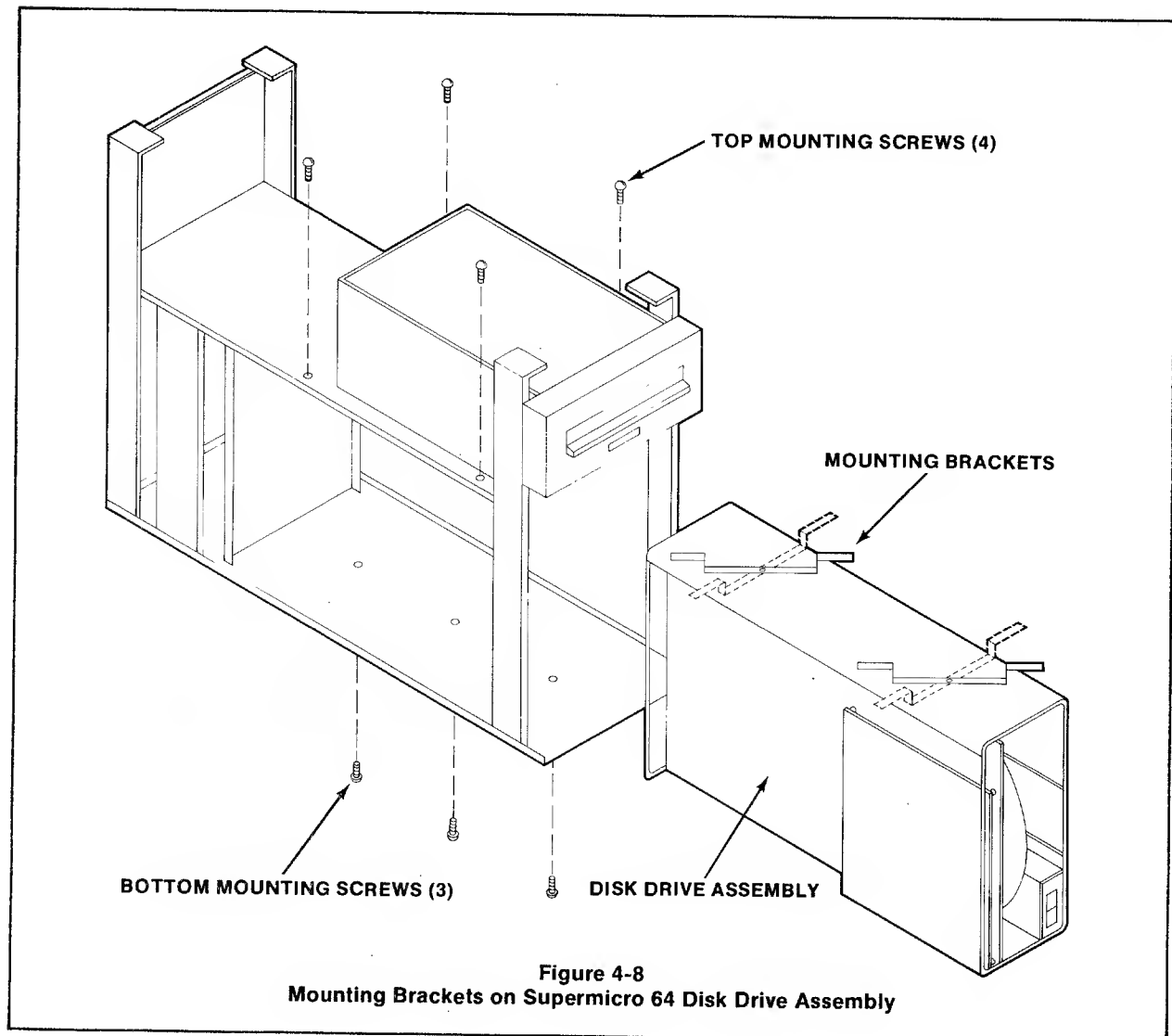


10. Remove the three drive assembly mounting screws at the bottom of the cabinet. You can do this by letting the computer extend beyond the edge of the table as necessary.

CAUTION

If you lay the computer on its left side, be very careful when removing the bottom screws, as the disk drive weighs approximately 60 pounds.

11. Carefully slide the drive assembly out through the front of the cabinet. Turn the mounting brackets at the top of the assembly so as to clear the cabinet frame and all cables. Be careful not to pinch or snag any wiring as you remove the drive assembly.
12. Remove the top mounting brackets from the old drive and fasten them to the new one.
13. Replace the disk drive assembly by reversing the procedure of steps 1 through 11 above. Be careful not to pinch the cable to the power-on switch when you replace the lower front cover on the cabinet.





14. Power up the system in diagnostic mode (see Installation and User Reference Manual, Sec. 3.4) and format the newly installed drive as described in the Installation and User Reference Manual, Sec. 4.3.

4.3.5 Tape Drive Assembly, Supermicro 8 and Supermicro 32

To remove the tape drive assembly on the Supermicro 8 or Supermicro 32, proceed as follows:

1. Shut the system down and remove the power cord from the rear of the unit.
2. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
3. Remove the lower front cover from the cabinet by removing the two screws that hold the cover in place. You may have to loosen the two screws that hold the upper front cover in order to free the lower one.
4. At the rear of the drive, disconnect the tape drive interface cable from the drive PCB (see Figure 3-10). Disconnect the drive power cable from the PCB.
5. While supporting the drive assembly from underneath, remove the four mounting screws, two on each side, that hold the assembly in place. Remove the drive assembly through the front of the cabinet. Be careful not to snag any wires or components as you remove the drive.

To replace the tape drive assembly, reverse the above procedure.

4.3.6 File Processor

To remove the file processor from the computer, do the following:

1. Shut the system down and remove the power cord from the rear of the unit.
2. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
3. Note the correct orientation of the cables connected to the file processor PCB (see Figure 4-4). Disconnect all the cables from the file processor.
4. Remove the four screws that hold the file processor in place.

To replace the file processor, reverse the above procedure.

4.3.7 Power Supplies, Supermicro 8

–12 V Supply and +24 V Supply

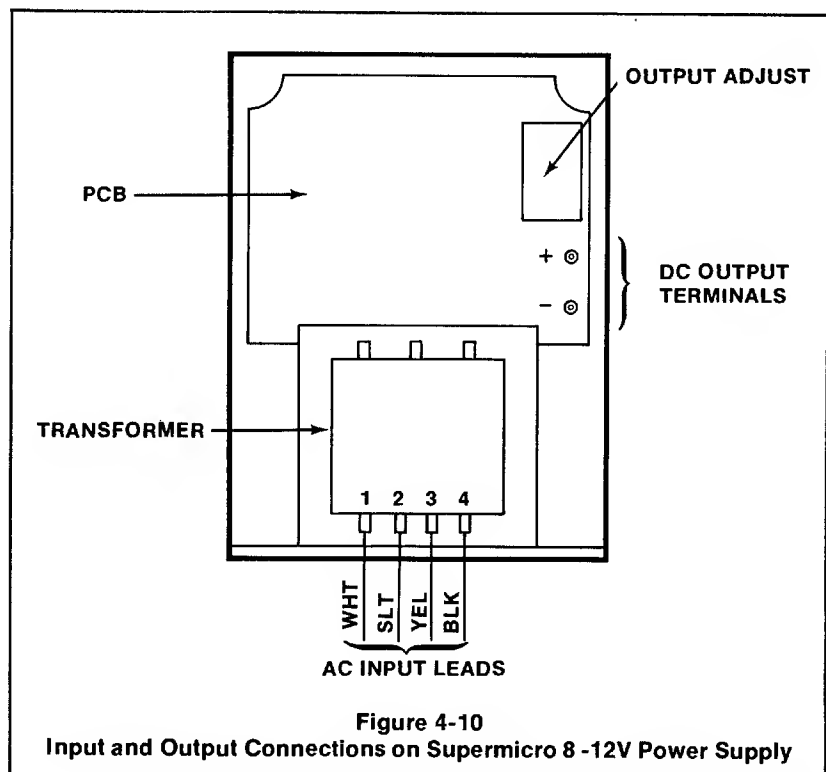
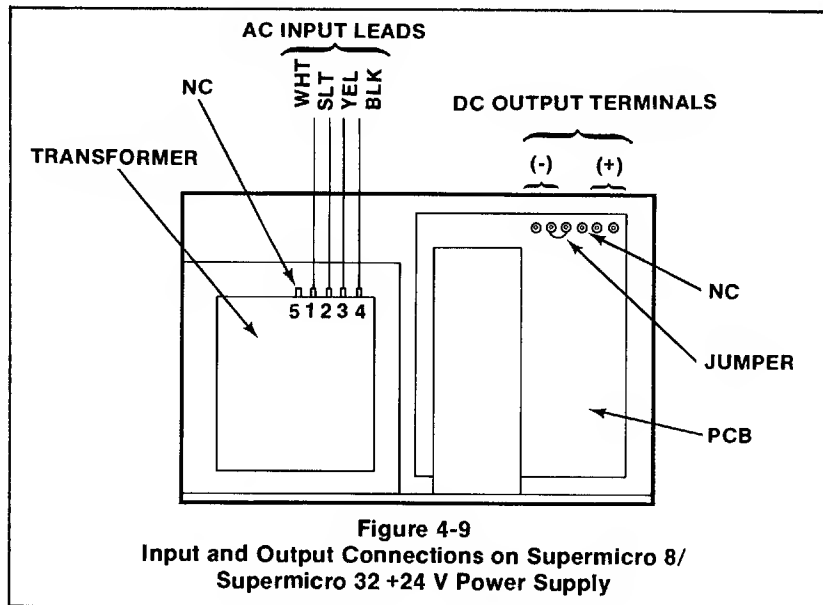
To remove either the –12 V or +24 V supply, do the following:

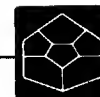
1. Shut the system down and remove the power cord from the rear of the unit.



2. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
3. Unsolder the input and output leads from the supply to be removed (see Figure 4-9 or 4-10).
4. Remove the screws that hold the power supply in place.

To replace the supply, reverse the above procedure.





+5 V Supply and +12 V Supply

To remove either the +5 V or +12 V supply, proceed as follows:

1. Shut the system down and remove the power cord from the rear of the unit.
 2. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
 3. Remove the lower front cover from the cabinet by removing the two screws that hold the cover in place. You may have to loosen the two screws that hold the upper front cover in order to free the lower one.
 4. At the rear of the power supply assembly, disconnect the five power harness connectors (white plastic) from the supply.
 5. Remove the four mounting screws, two in front and two in back, that hold the lower power supply assembly in place.
 6. Loosen by about $\frac{1}{2}$ turn the two front mounting screws, one on each side, of the hard-disk drive assembly.
 7. While supporting the rear of the drive assembly, remove the two rear mounting screws.
 8. Lift the rear of the drive assembly so that the +5 V power connector on the controller PCB clears the power supply as you slide the supply out the front of the cabinet.
 9. Unsolder the input and output leads from the individual supply to be replaced.
 10. Remove the mounting hardware that holds the supply in place.
- To replace the supply, reverse the above procedure.

4.3.8 Power Supplies, Supermicro 32

+24 V Supply

To remove the +24 V supply from the Supermicro 32, do the following:

1. Shut the system down and remove the power cord from the rear of the unit.
2. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
3. Unsolder the input and output leads from the power supply (see Figure 4-9).
4. Remove the screws that hold the supply in place. To replace the power supply, reverse the above procedure.



+/-5 V and +/-12 V Supply

To remove the lower power supply from the Supermicro 32, proceed as follows:

1. Shut the system down and remove the power cord from the rear of the unit.
2. Remove both side panels from the computer cabinet. Four screws hold each panel in place.
3. Remove the lower front cover from the cabinet by removing the two screws that hold the cover in place. You may have to loosen the two screws that hold the upper front cover in order to free the lower one.
4. At the rear of the power supply, disconnect the 12 leads from the terminal strip on the power supply mounting bracket.
5. Remove the four screws, two in front and two in back, that hold the power supply mounting bracket in place.
6. Slide the power supply out the front of the computer cabinet.

To replace the power supply, reverse the above procedure.

4.3.9 Power Supplies, Supermicro 64

Main Power Supply

To remove the main power supply from the Supermicro 64, do the following:

1. Shut the system down and remove the power cord from the rear of the unit.
2. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
3. Remove the left side panel from the cabinet by removing the four screws that hold the panel in place.
4. Disconnect all the leads from the screw-terminal strips on the power supply PCB.
5. Remove the four mounting screws that hold the large bracket on which both power supplies are mounted.
6. Remove the two mounting screws from the underside of the bracket that hold the main power supply.

To replace the main power supply, reverse the above procedure.

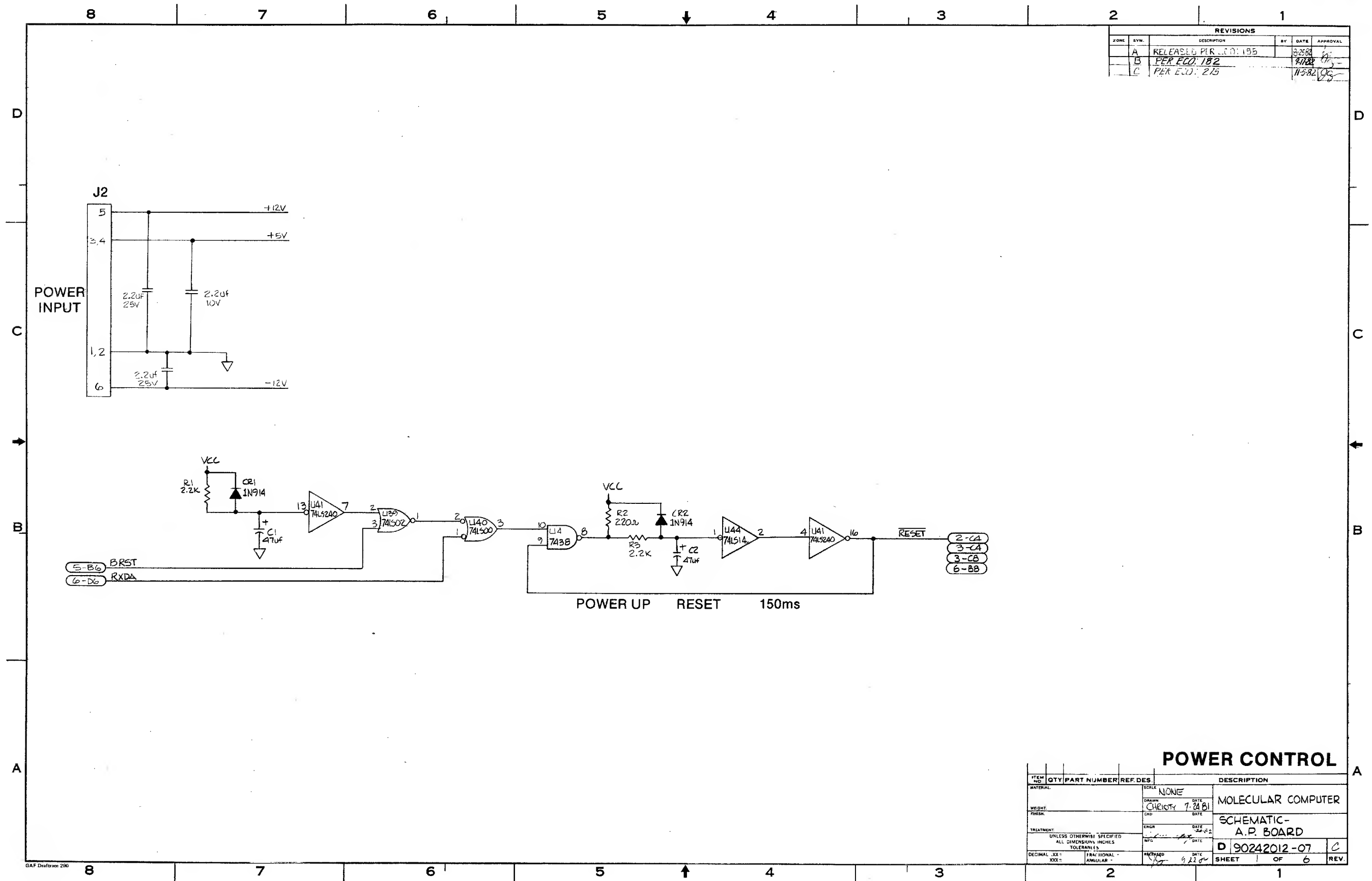
+5 V Supply

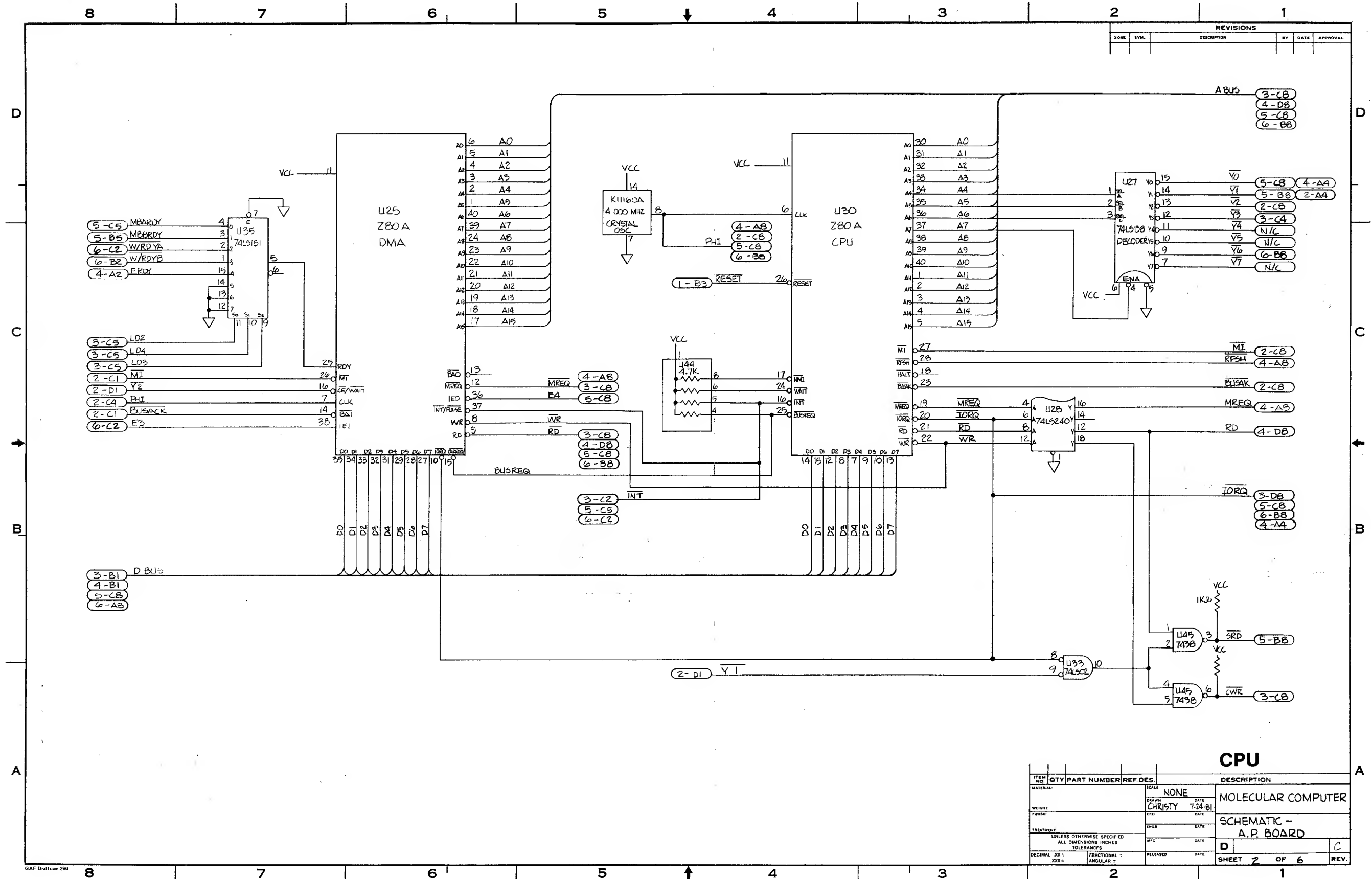
To remove the +5 V supply from the Supermicro 64, do the following:

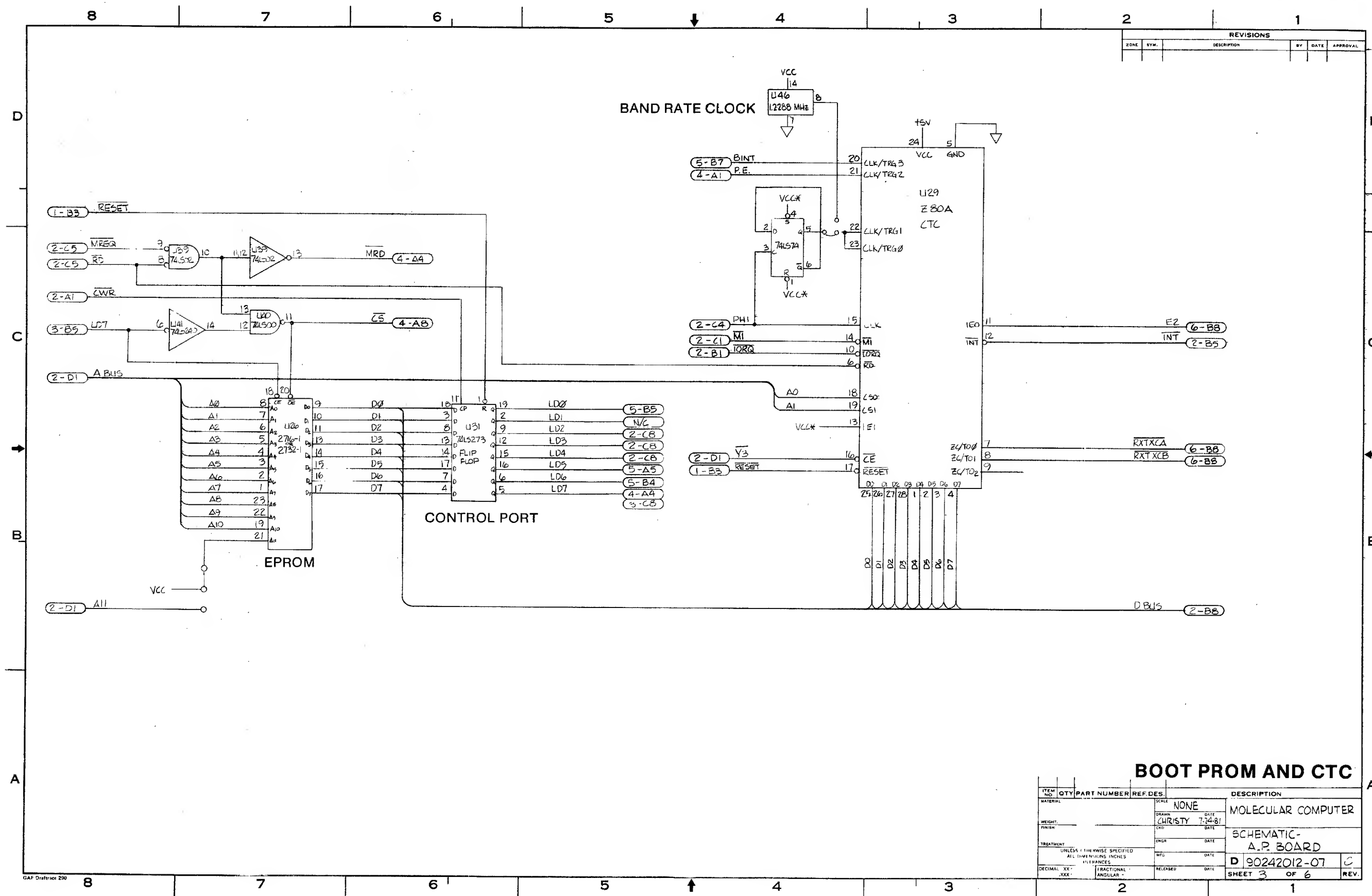
1. Shut the system down and remove the power cord from the rear of the unit.

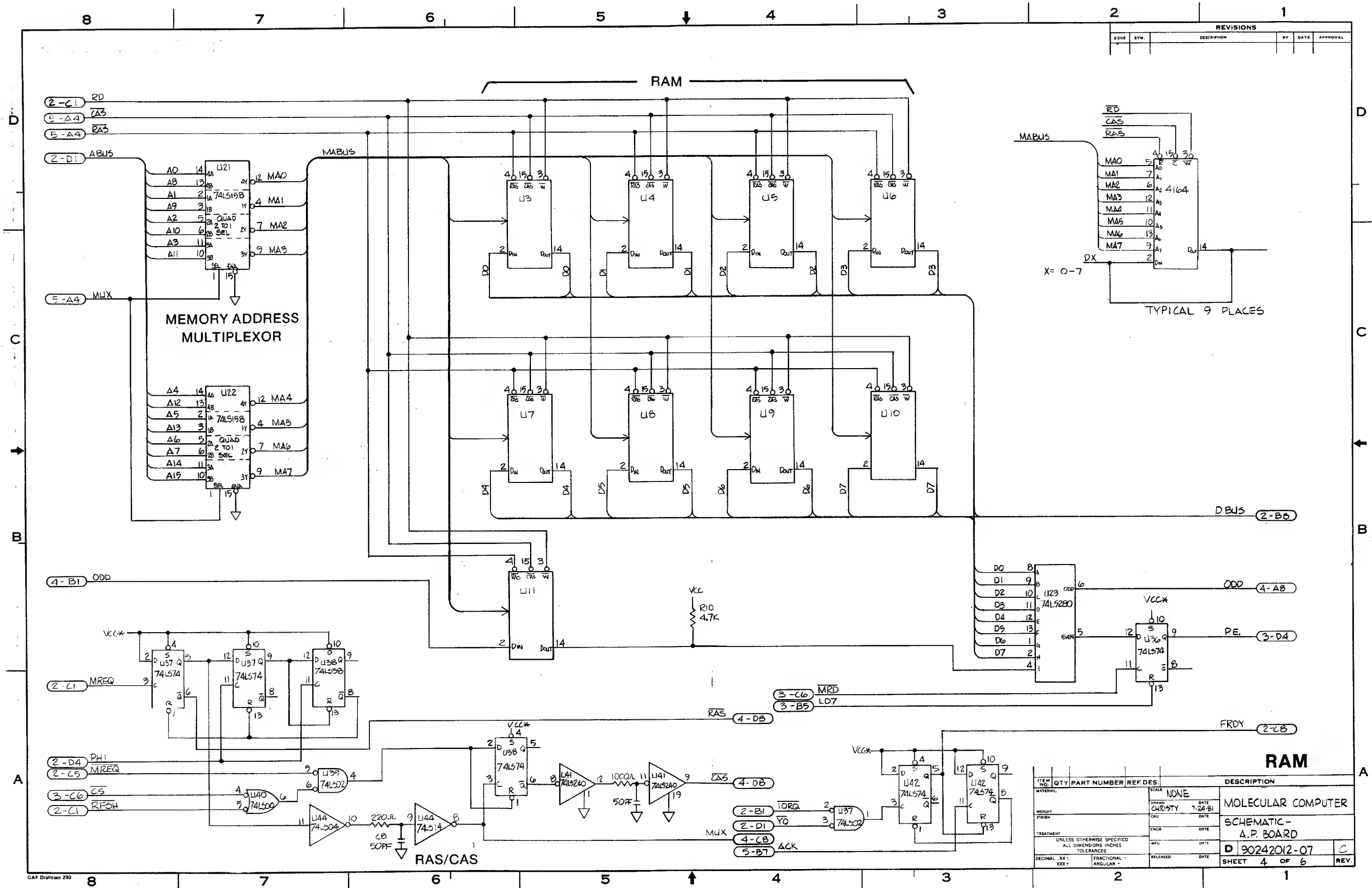


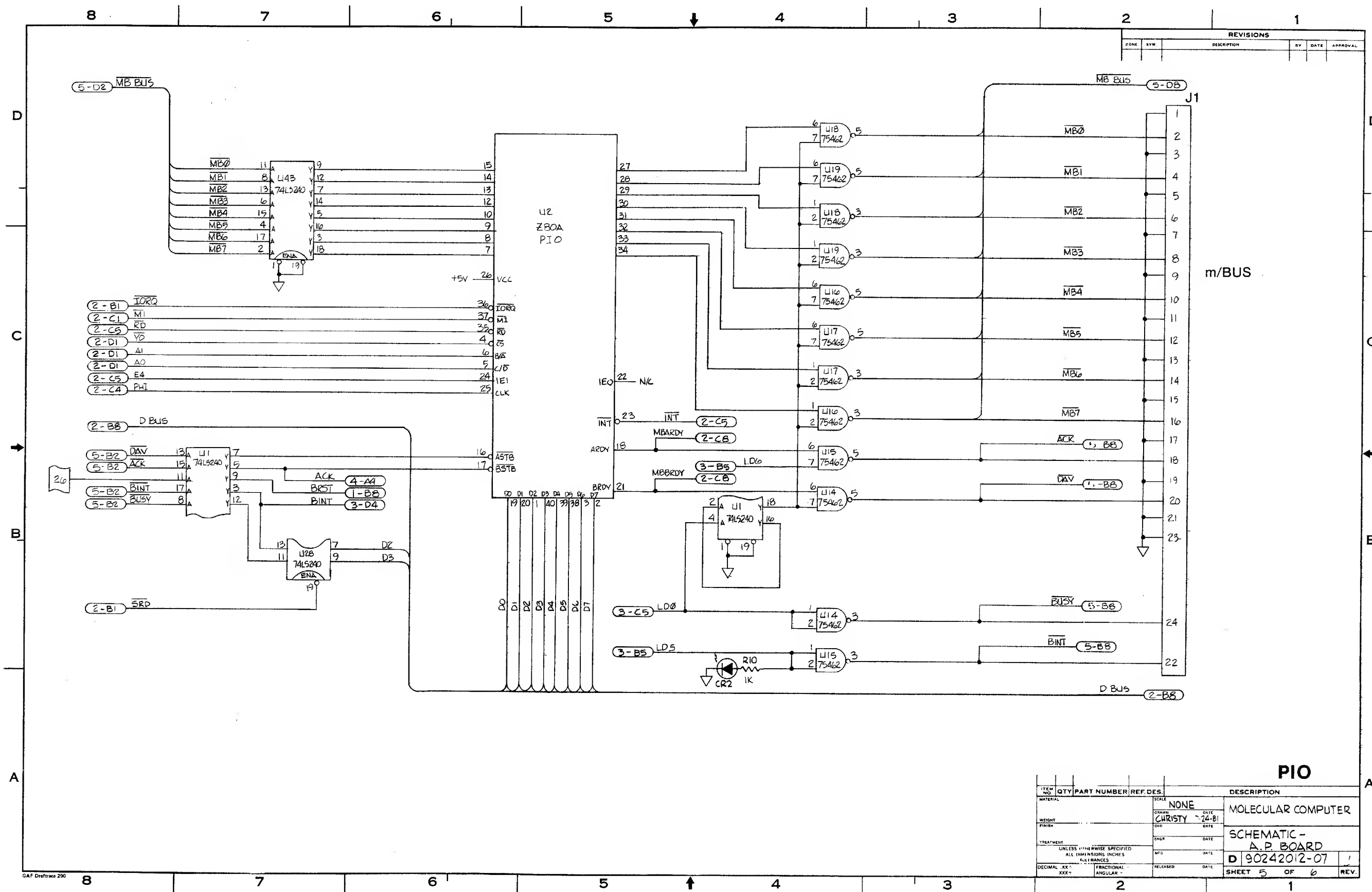
2. Take the top cover off the cabinet by removing the four screws that hold the cover in place.
3. Disconnect all the leads from the screw-terminal strips (TB1 and TB2) on the power supply. Disconnect the ground lead from the power supply mounting bracket.
4. Remove the two mounting screws that hold the supply in place. To replace the power supply, reverse the above procedure.

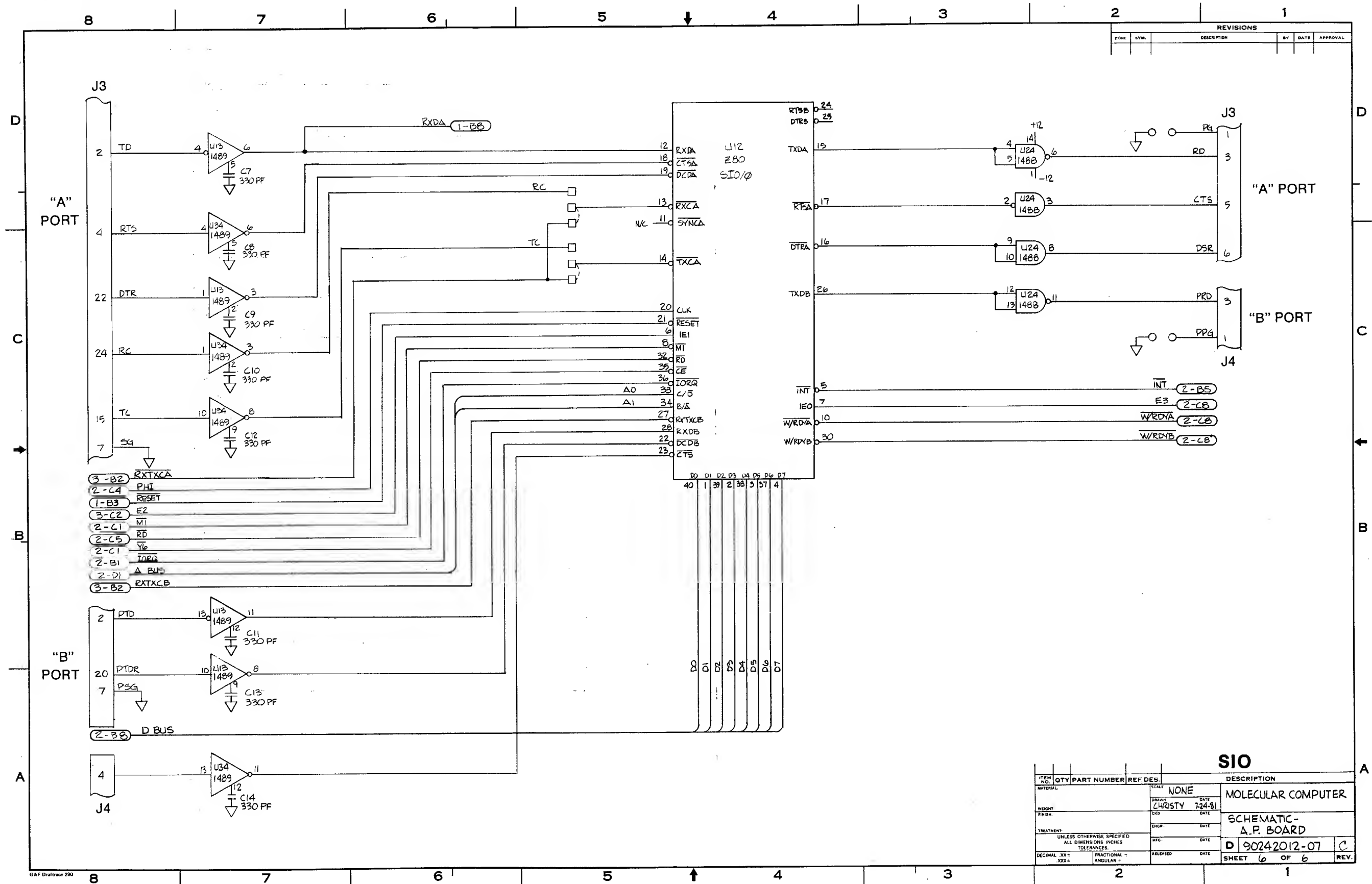


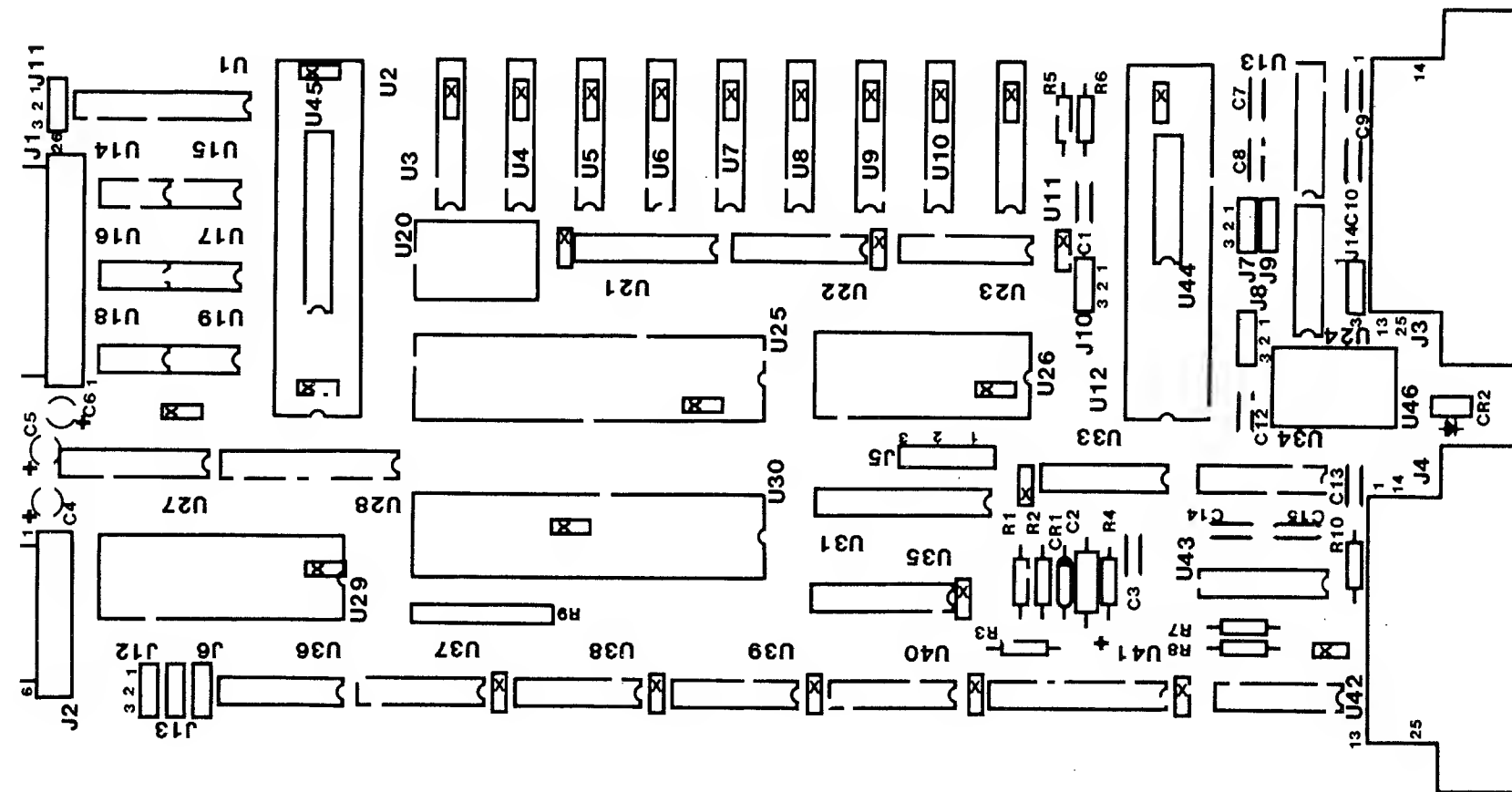




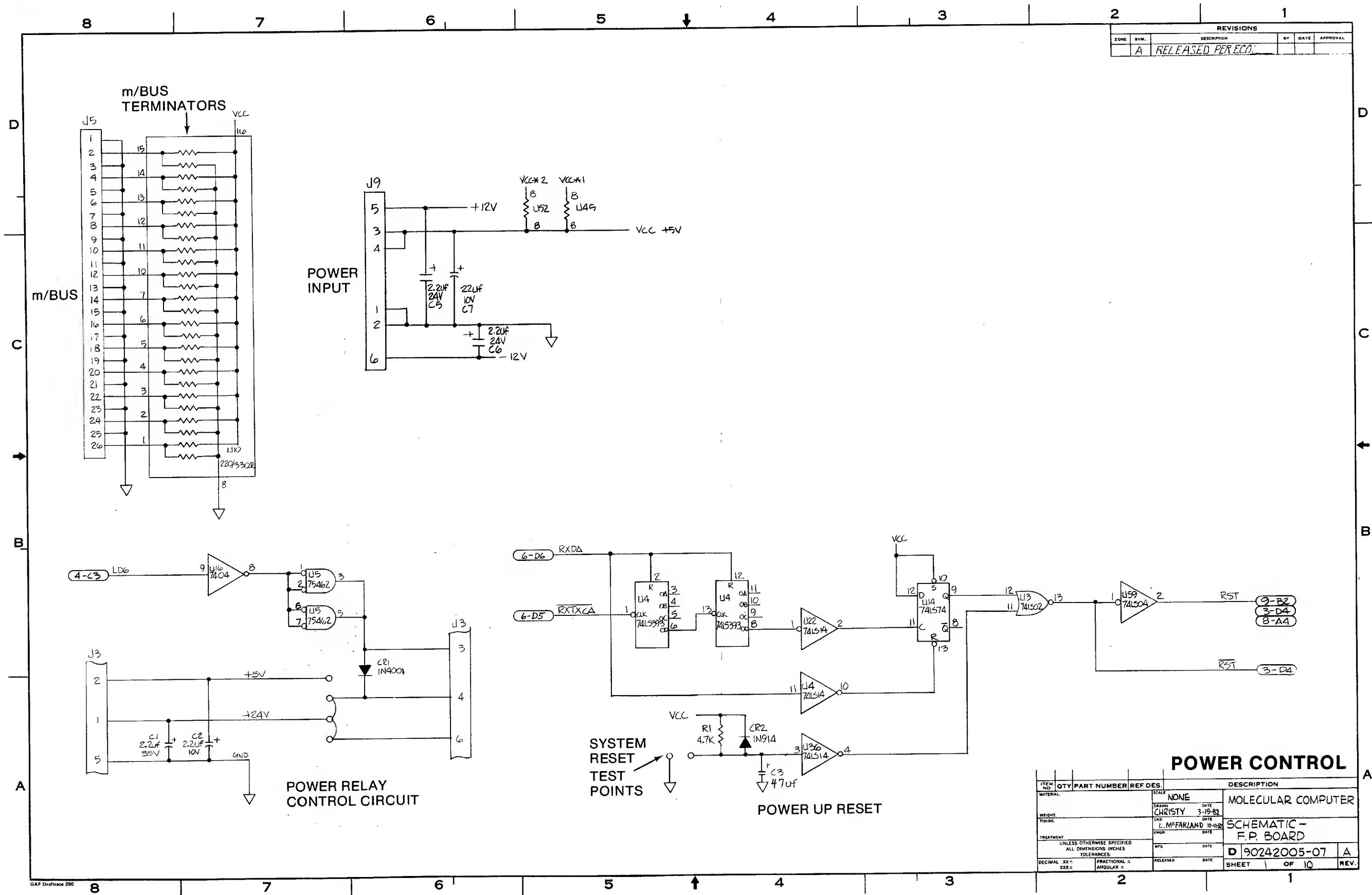


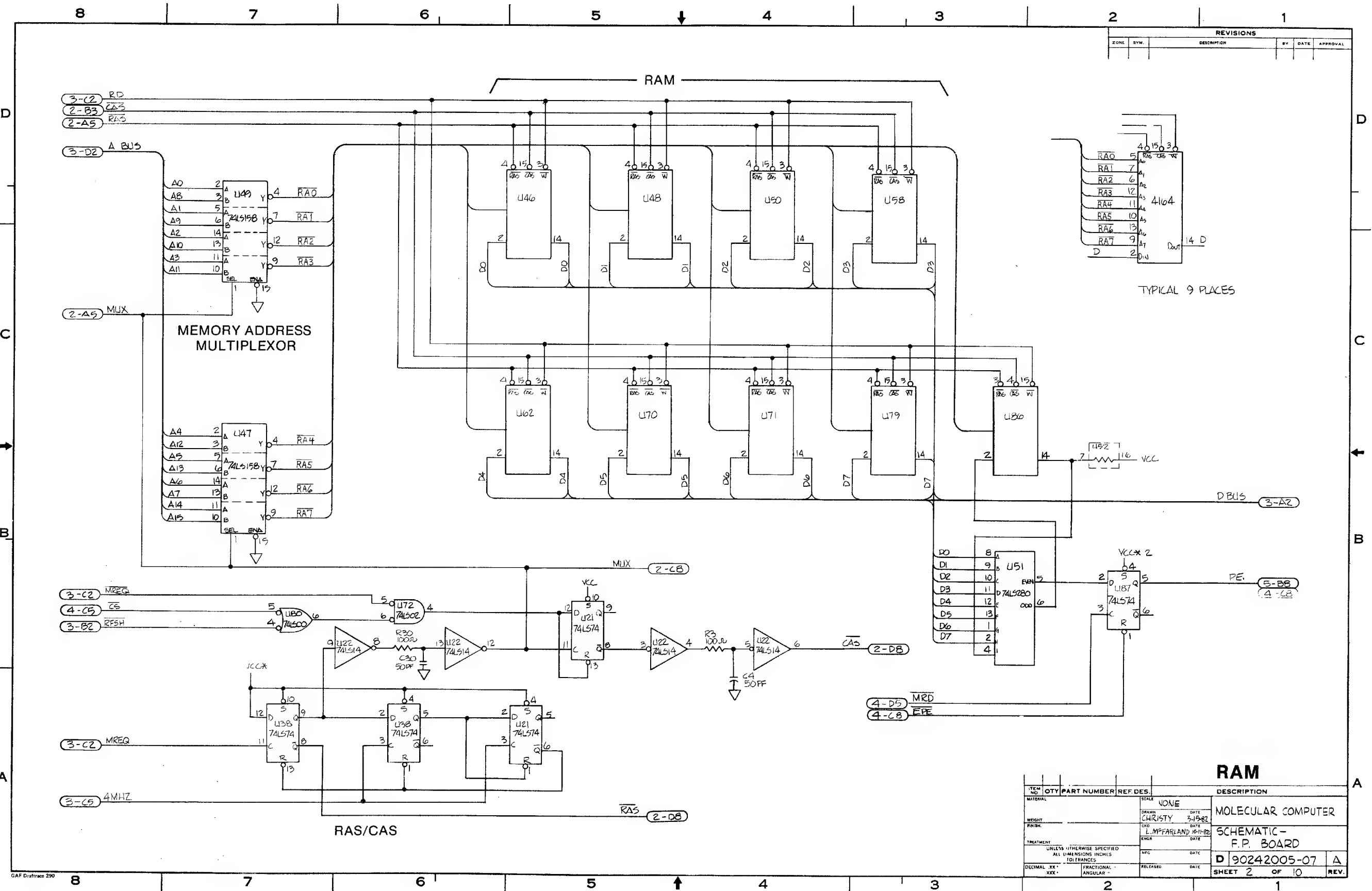


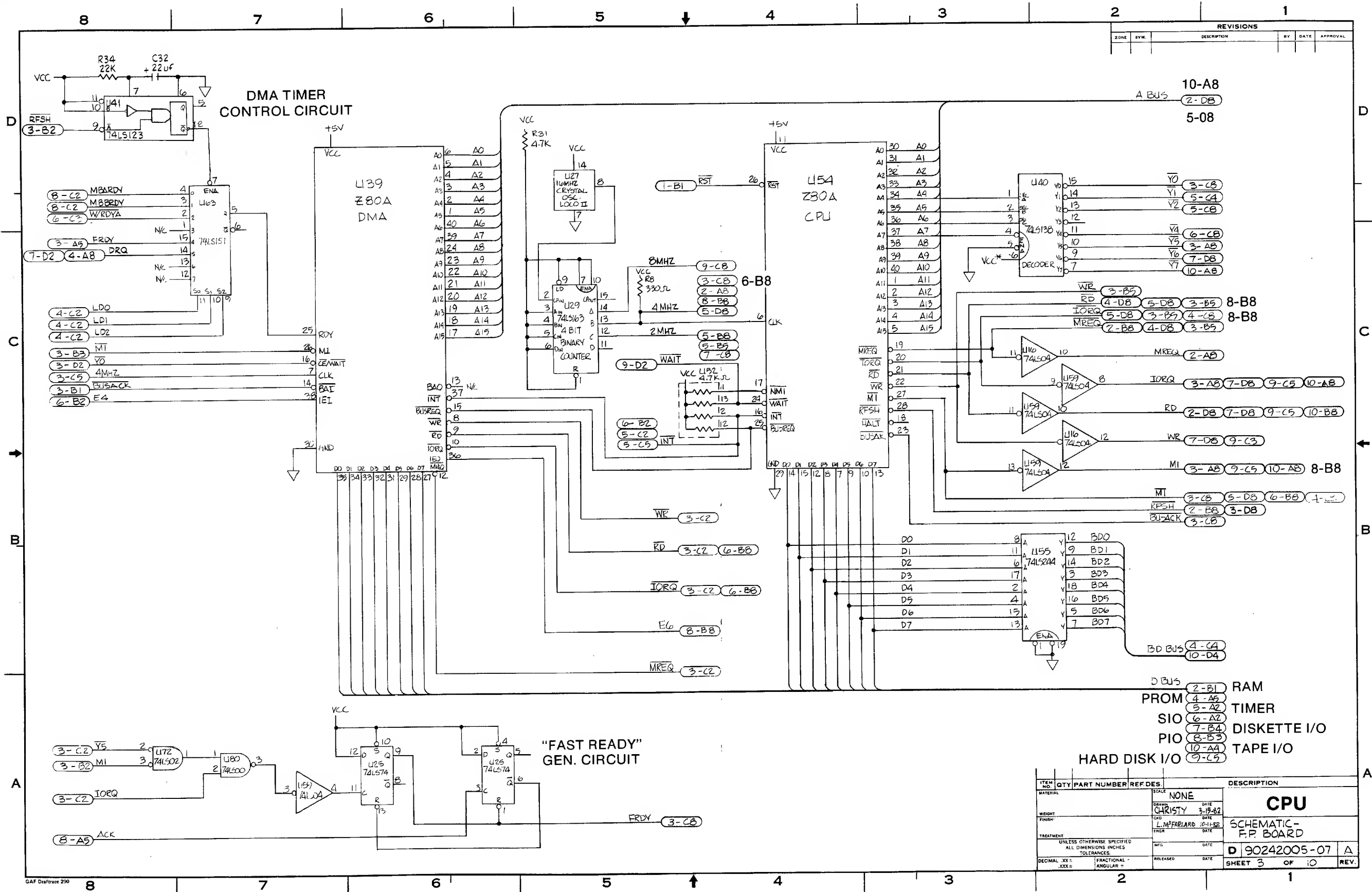


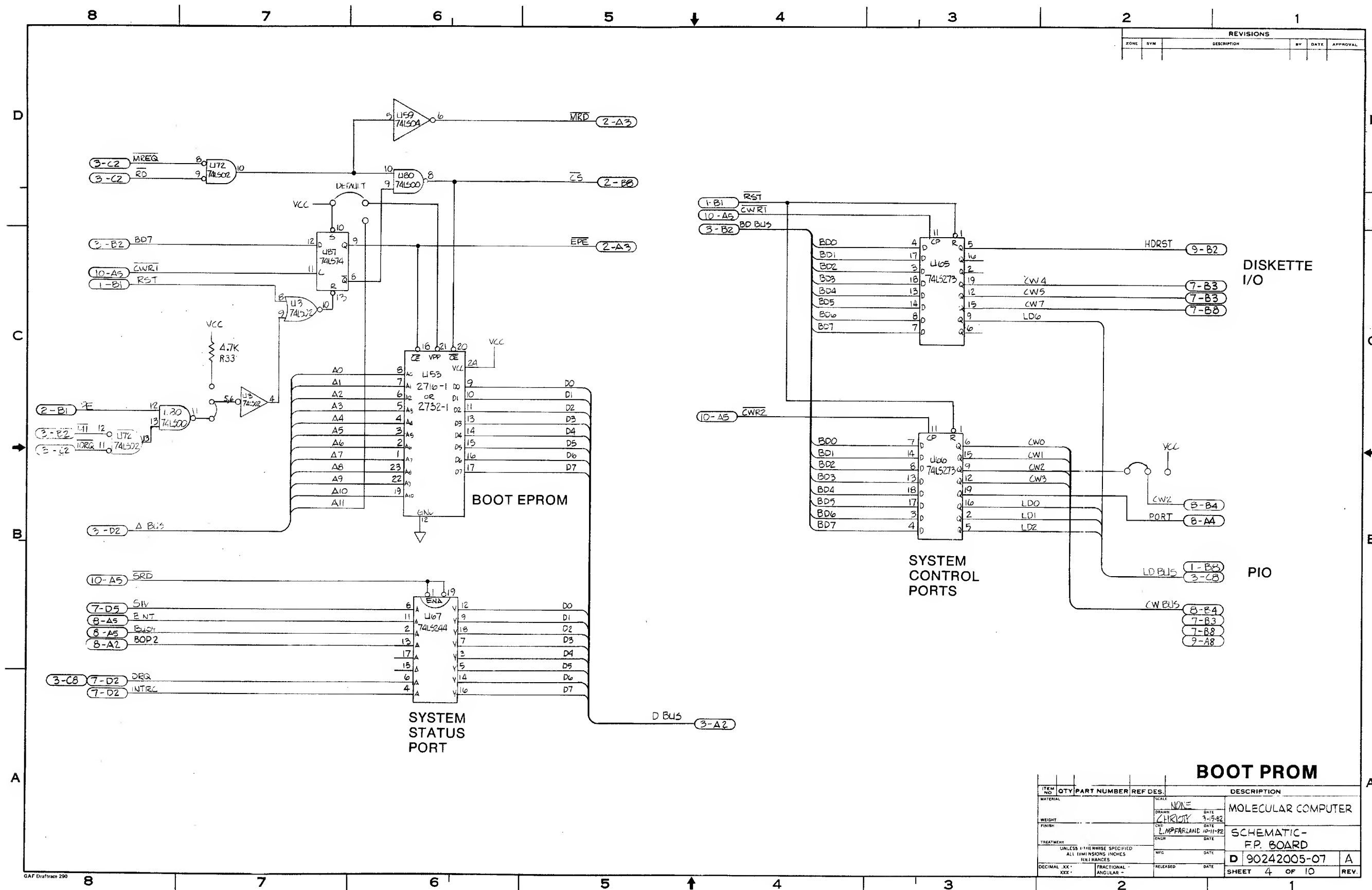


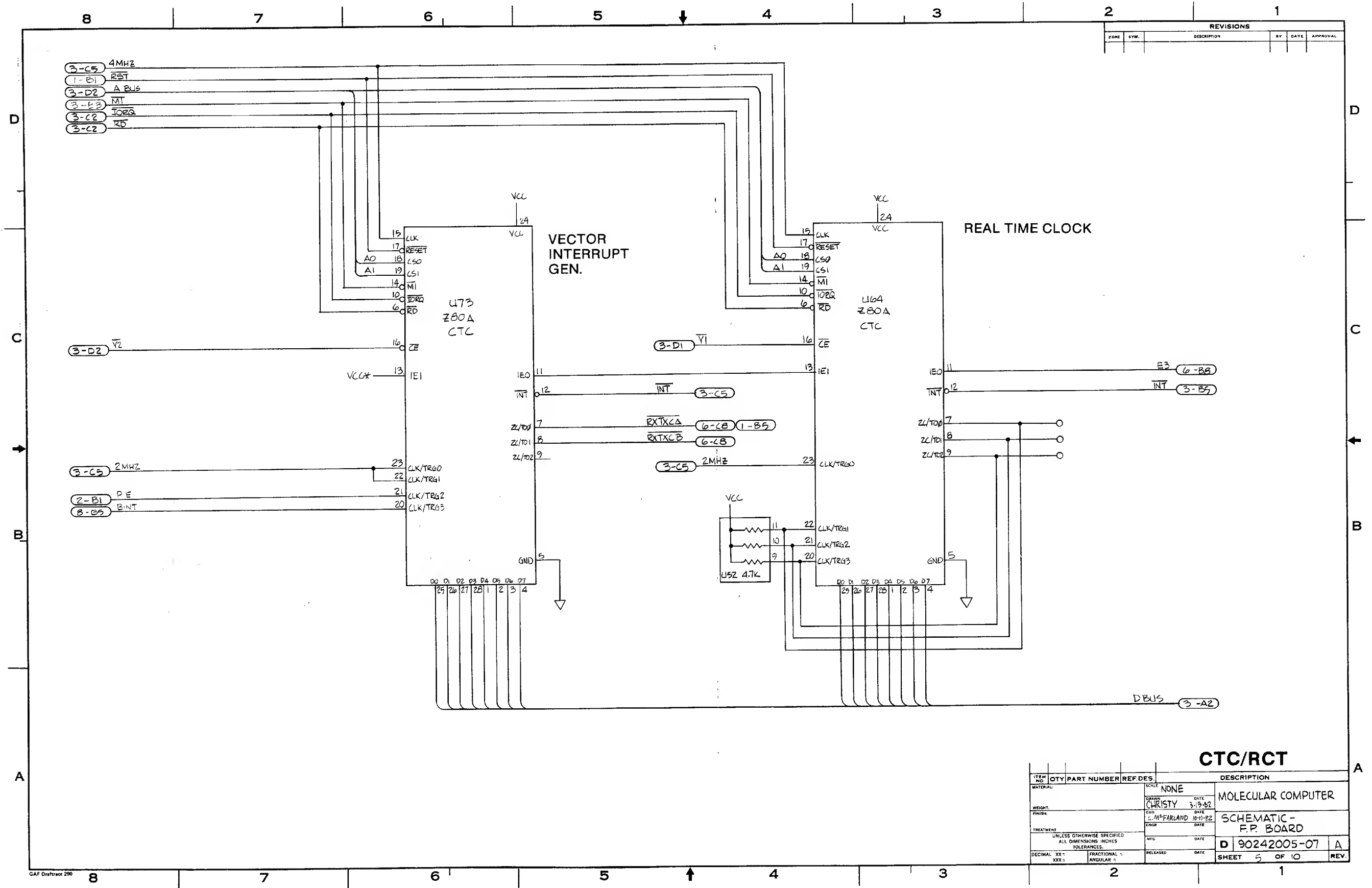
APPLICATION PROCESSOR
COMPONENT LOCATIONS

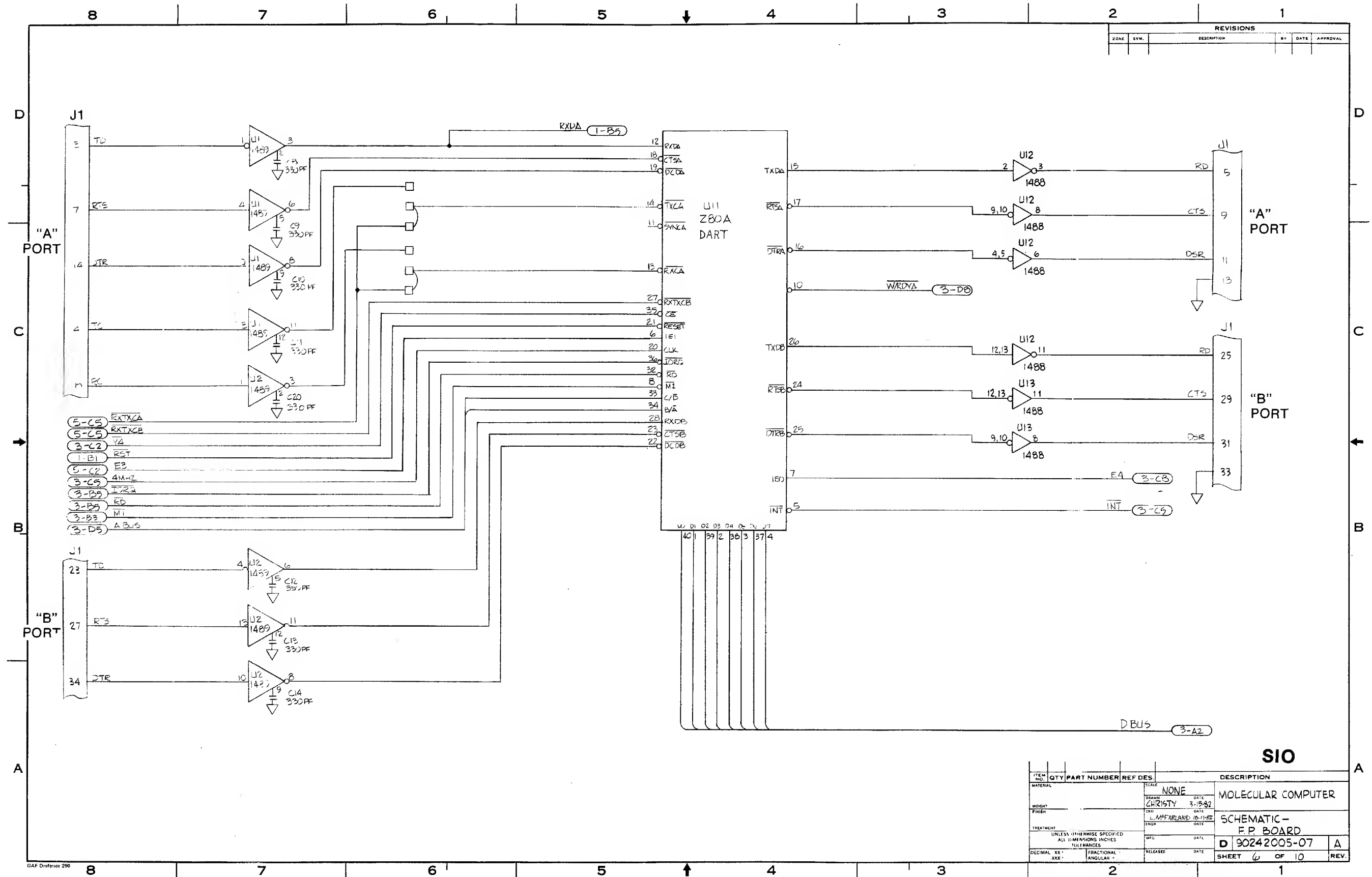


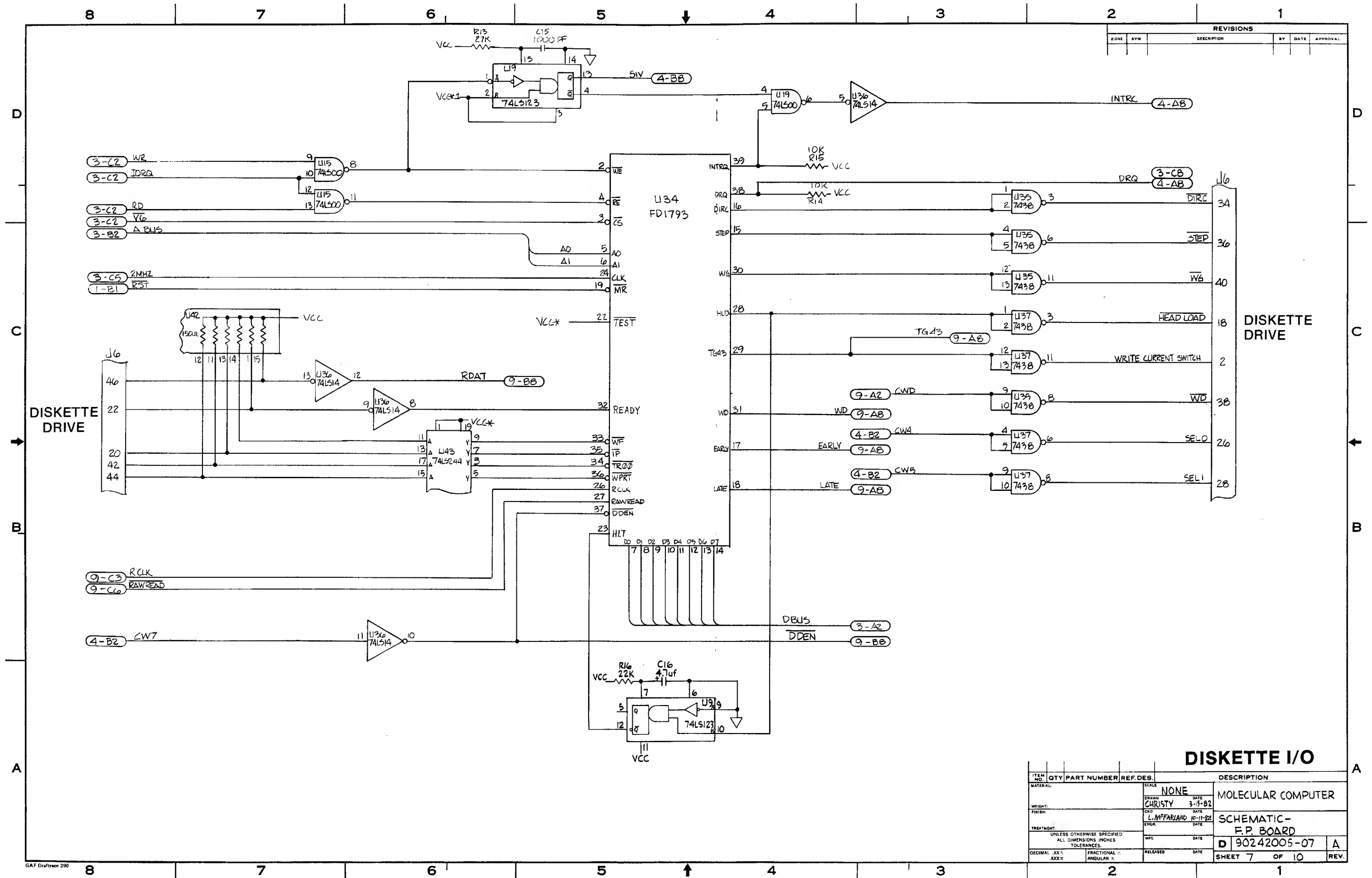


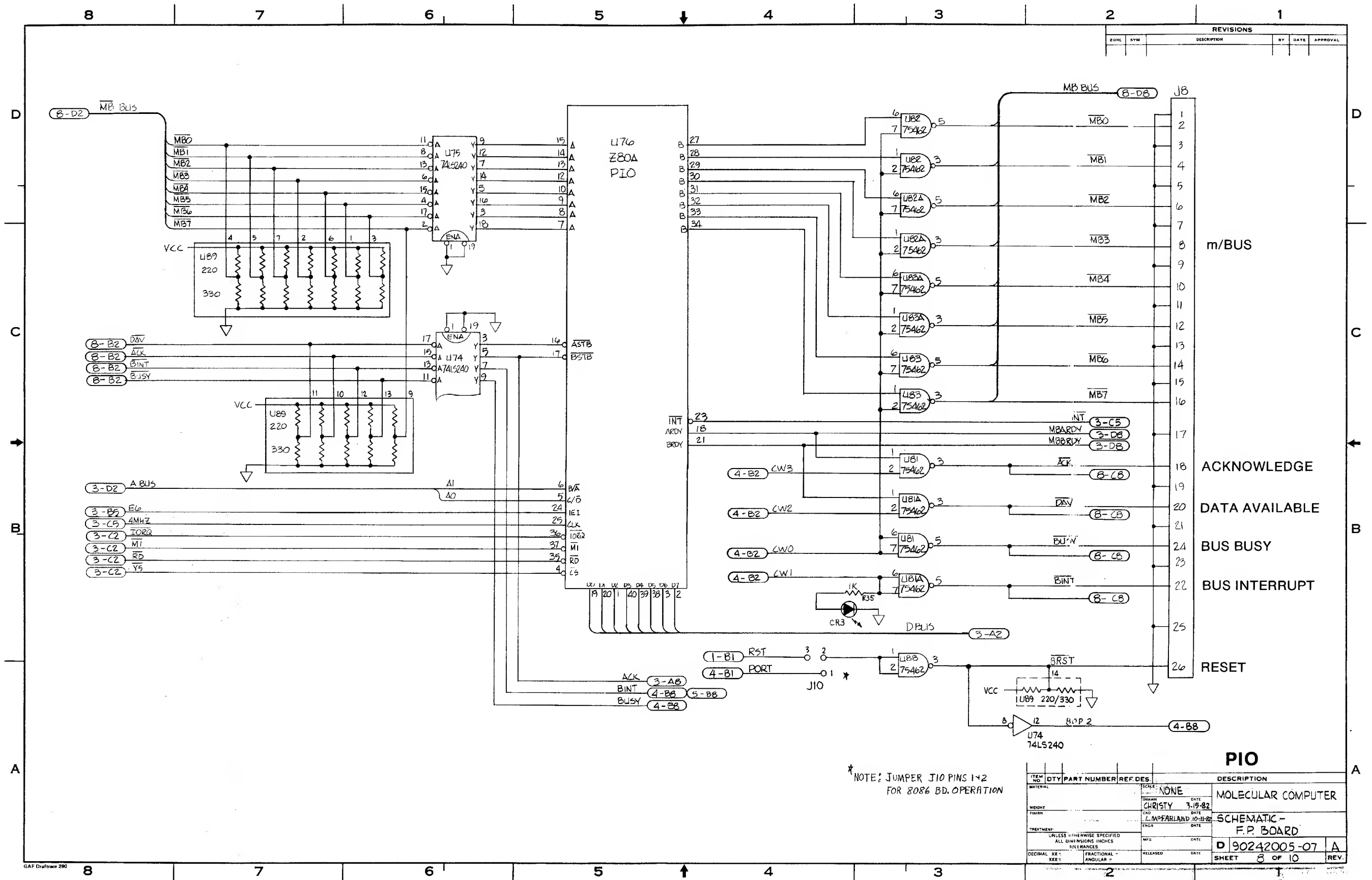


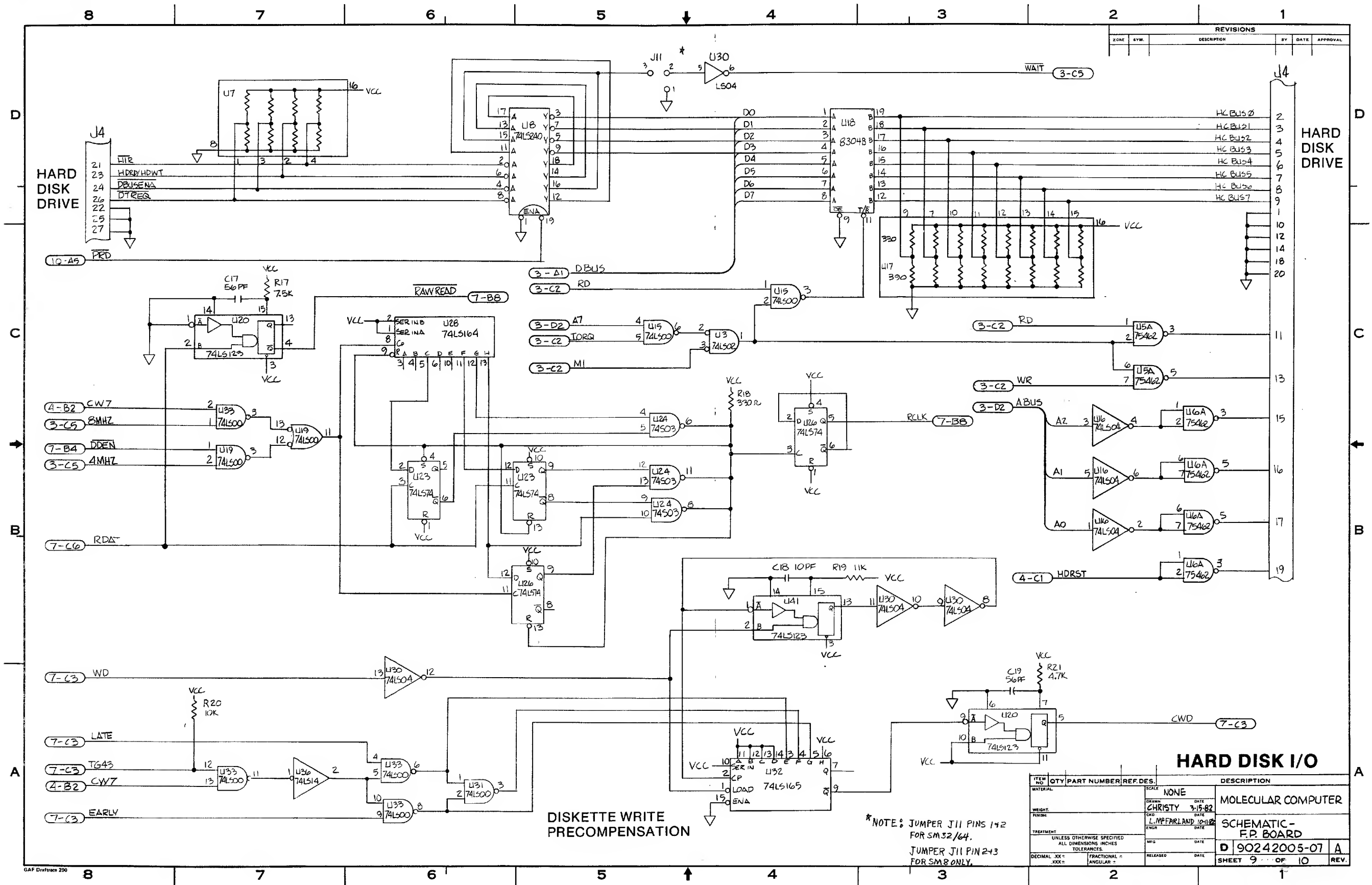


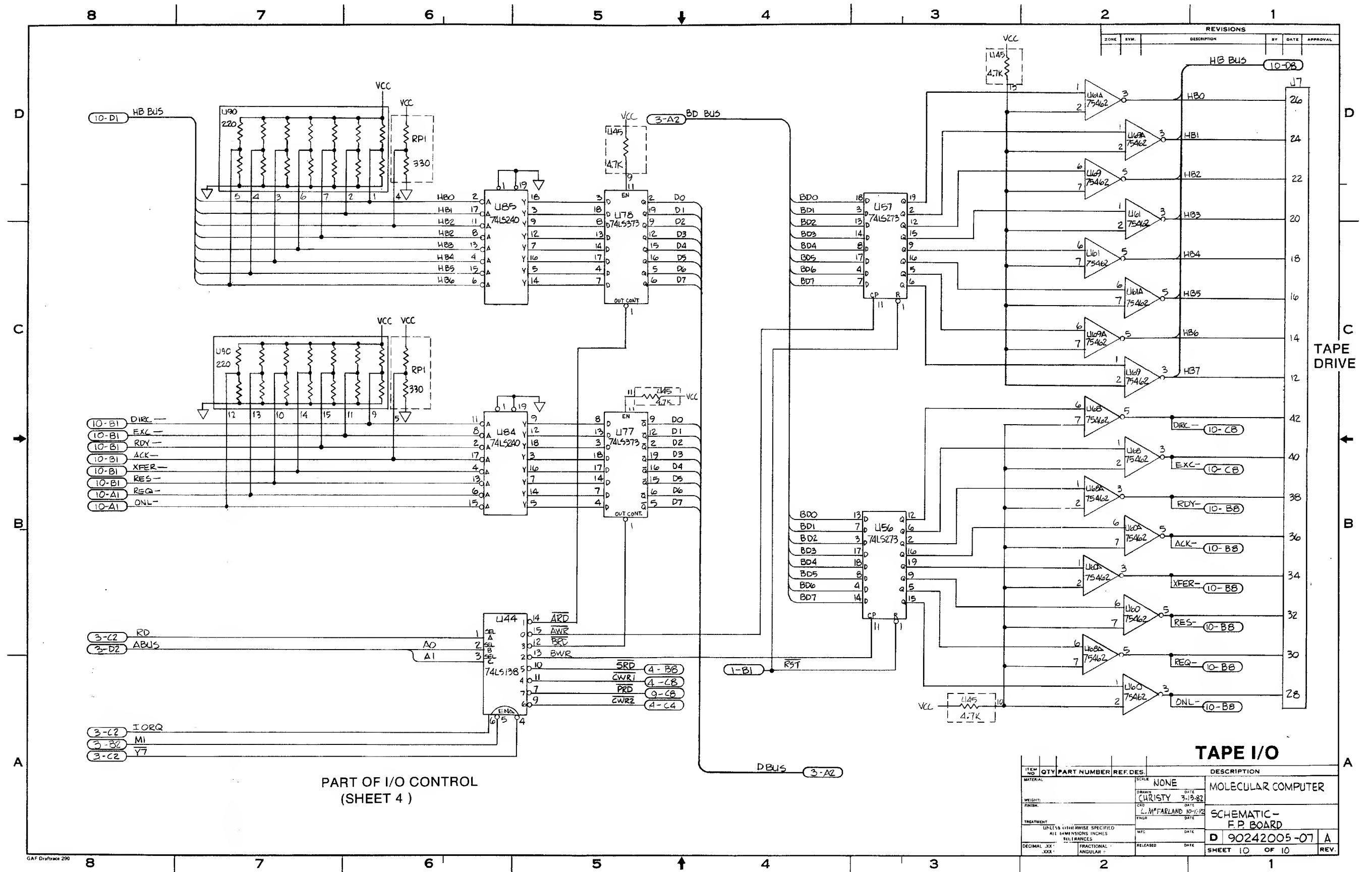


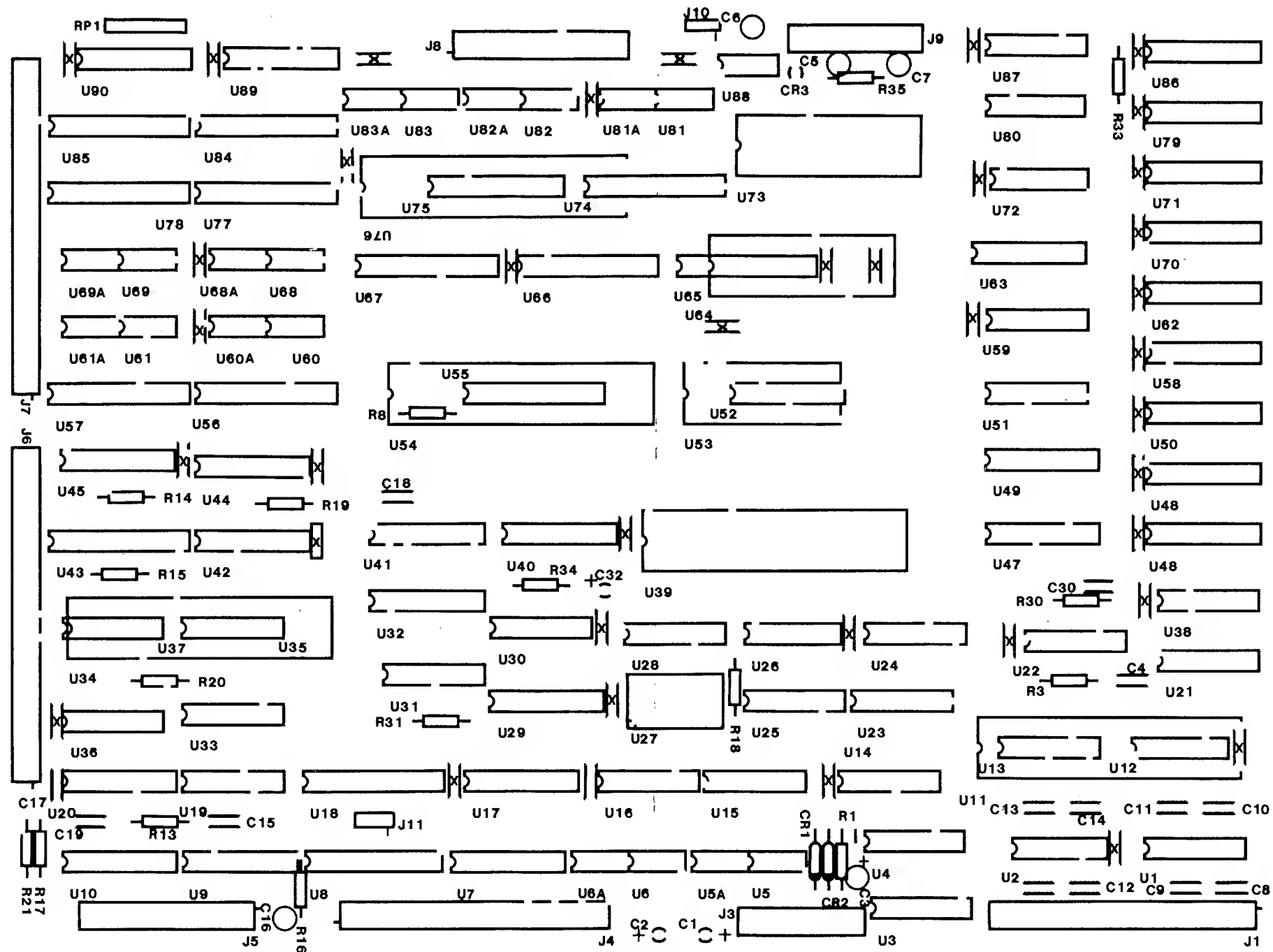




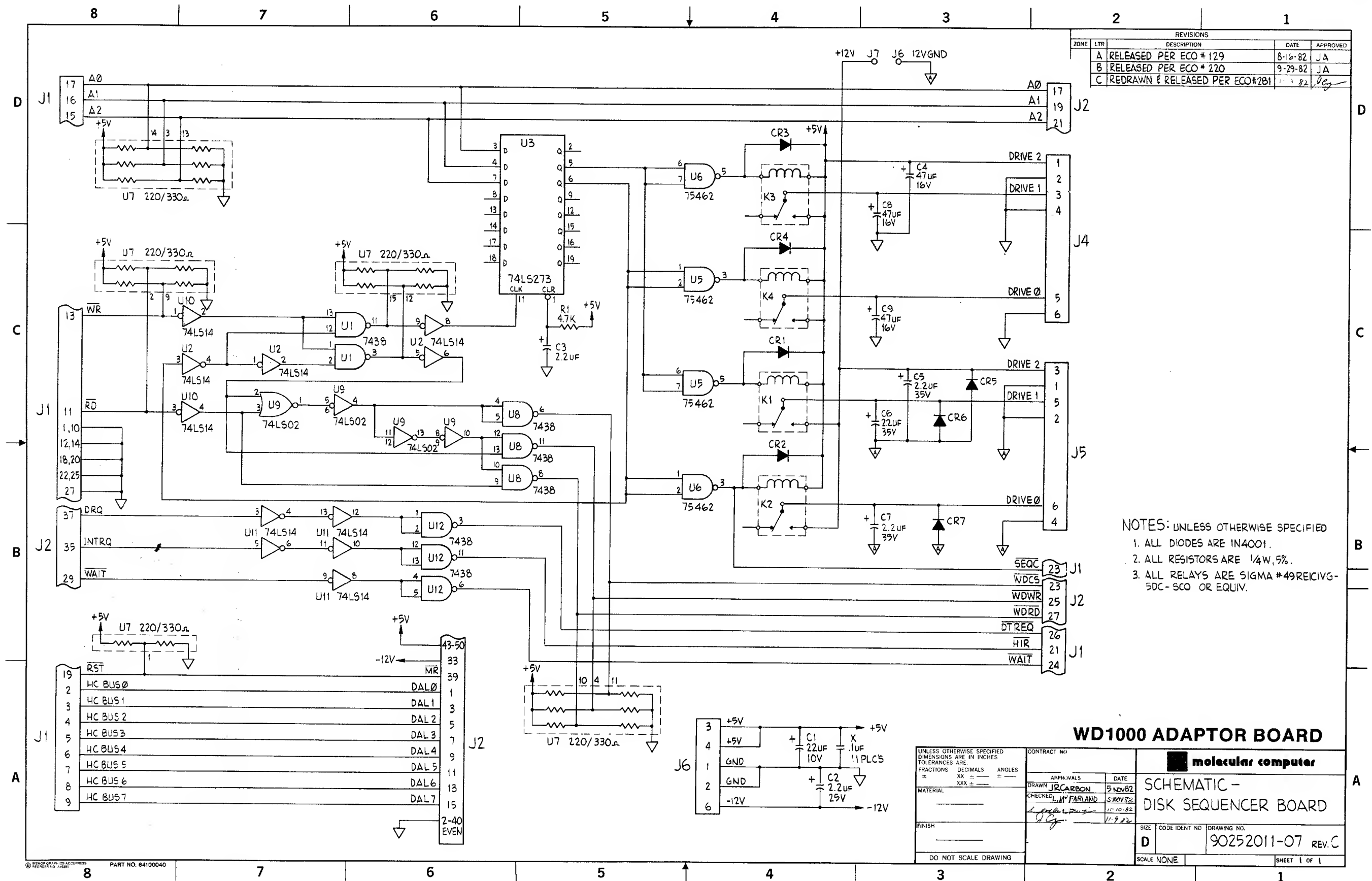


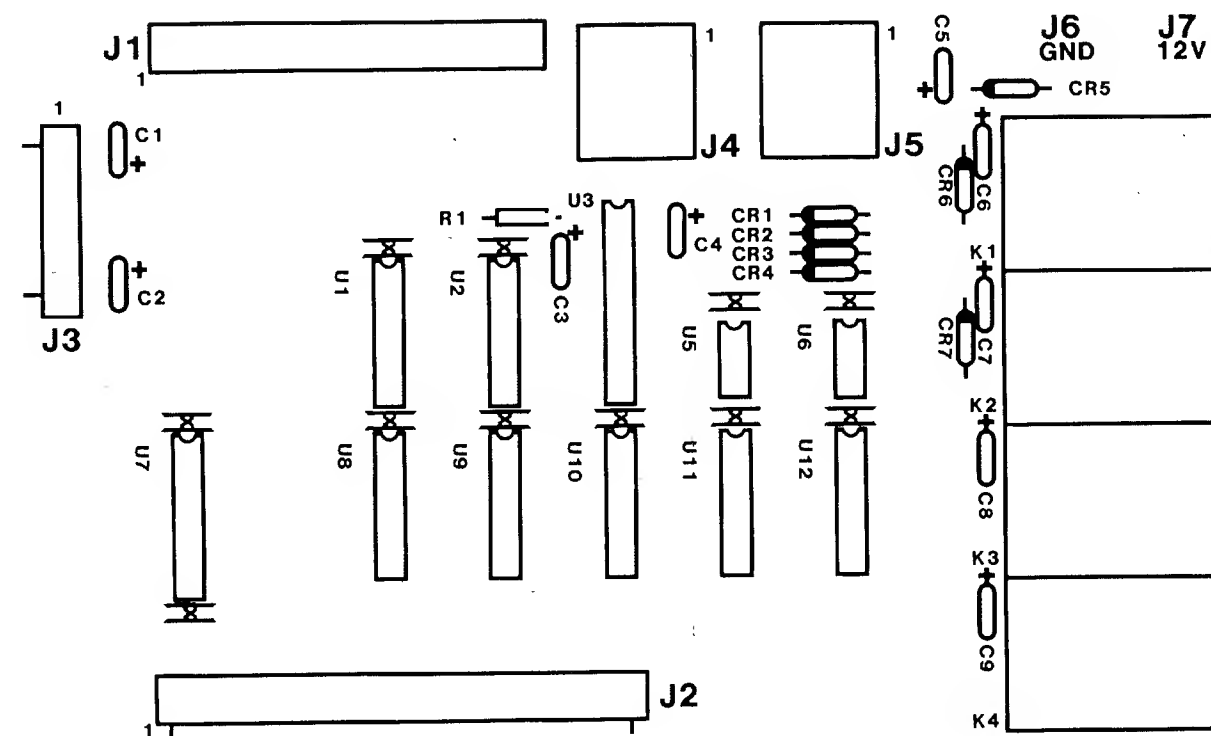




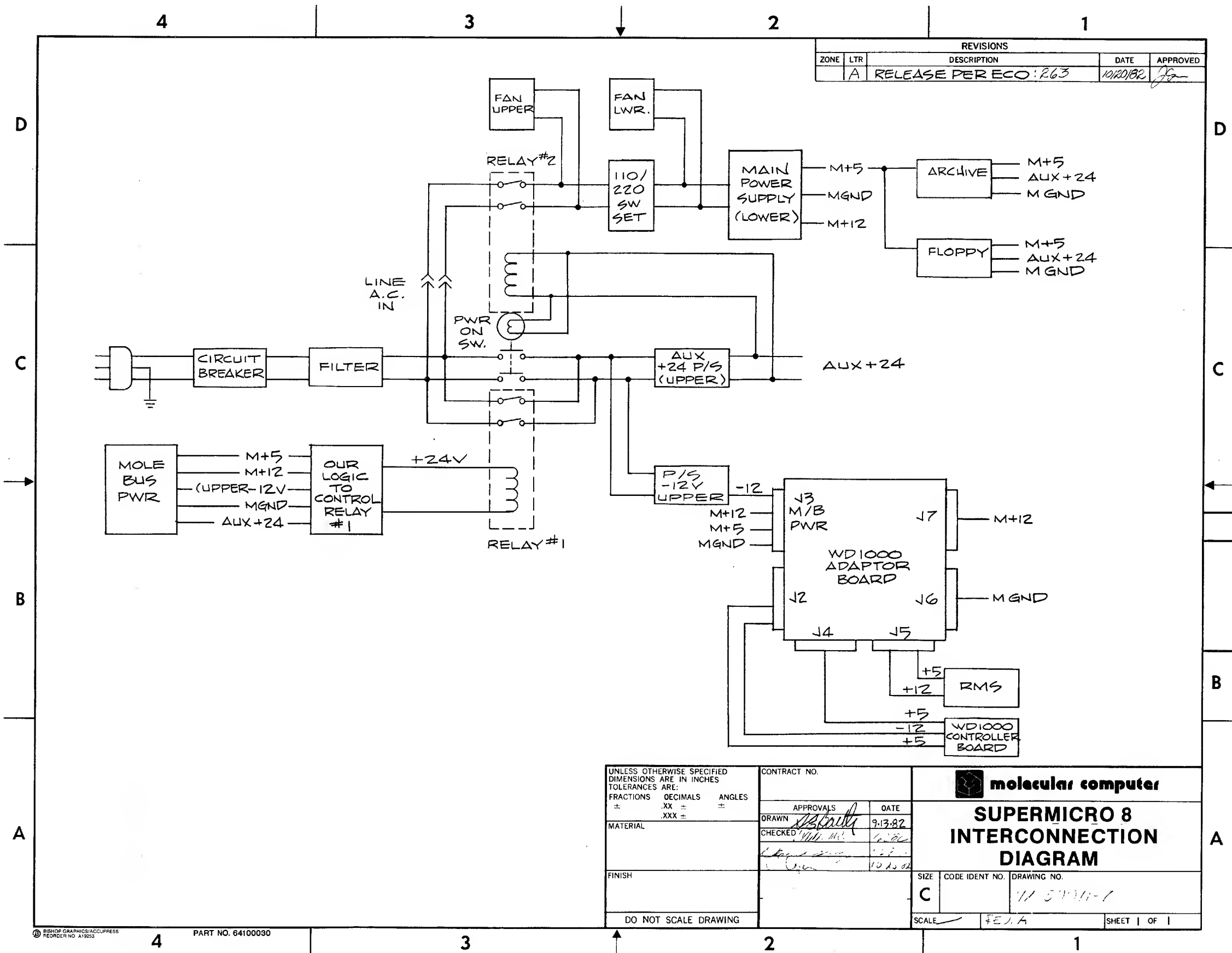


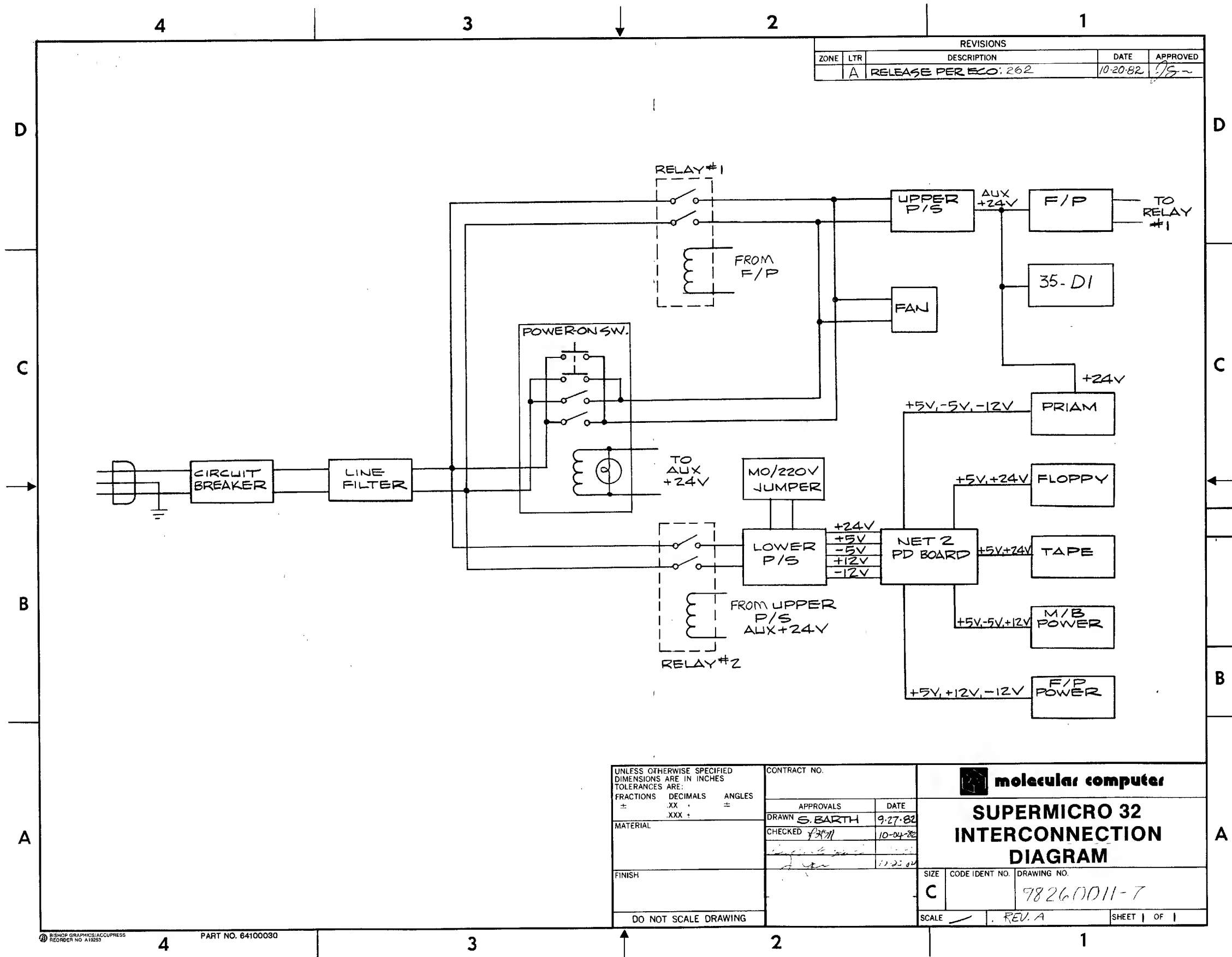
**FILE PROCESSOR
COMPONENT LOCATIONS**





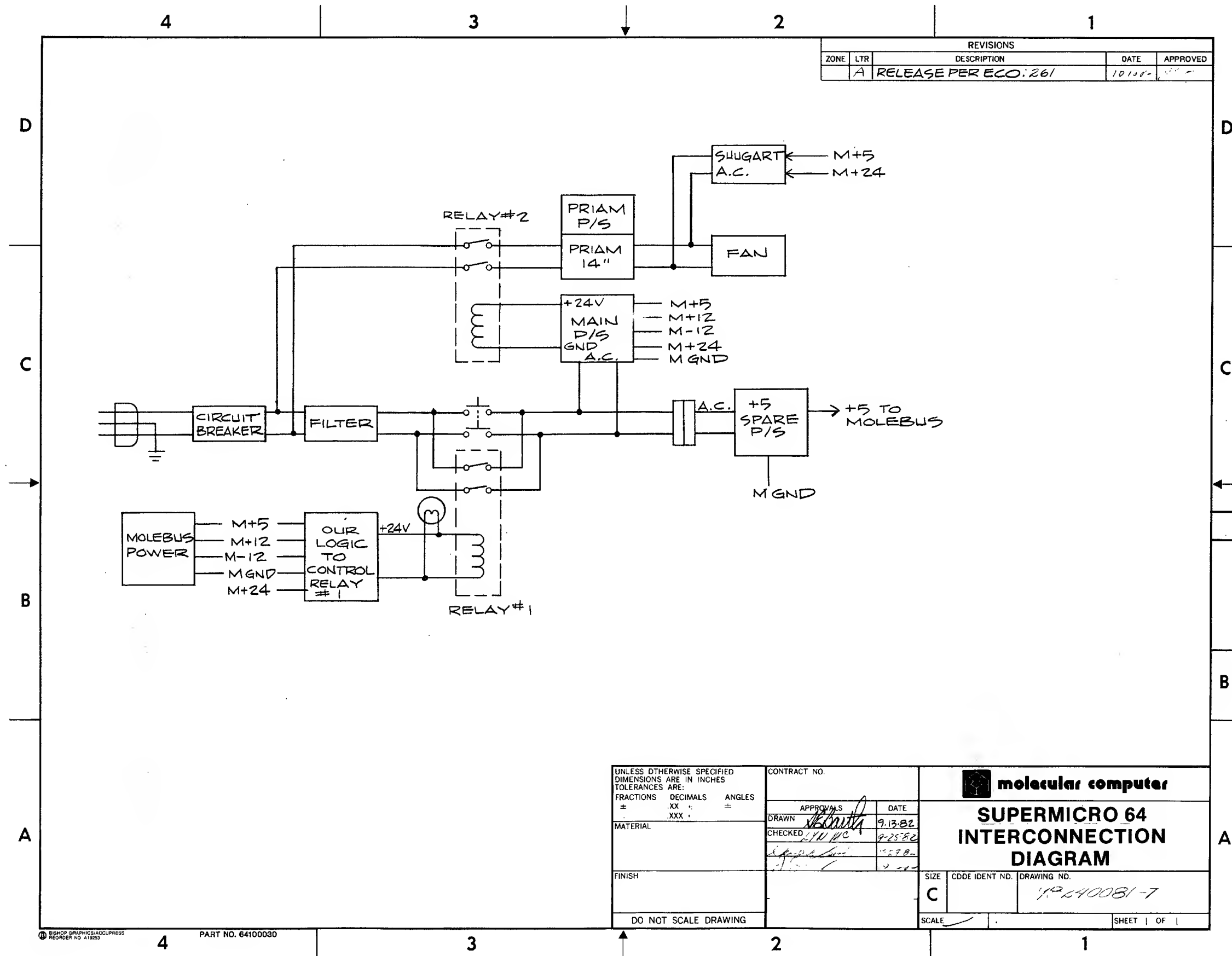
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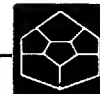




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VENDOR MANUALS

APPENDIX A

The publications listed below cover the vendor-supplied equipment in the Supermicro system. Unless otherwise noted, a given publication may be obtained from the manufacturer of the equipment or an authorized distributor.

Western Digital Corporation:

WD-1000 Winchester Disk Controller OEM Manual

Western Digital Corporation
2445 McCabe Way
Irvine, California 92714

Priam Corporation:

PRIAM DISKOS 3450; DISKOS 7050
8-inch Winchester Disc Drives OEM/Service Manual
PRIAM part number: 308000

PRIAM Switch and Jumper Manual, August 15, 1982

Product Specification - PRIAM Smart and Smart-E Interface PRIAM part number: 300115

PRIAM
20 West Montague Expressway
San Jose, California 95134

Shugart Corporation:

SA850/851 Bi-Complaint Double Sided Diskette Storage Drive
Service Manual
Shugart part number: 39017

SA810/860 Single/Double-sided Slimline Diskette Storage Drives
OEM Manual
Shugart part number: 39216

Shugart
475 Oakmead Parkway
Sunnyvale, California 94086

Seagate Technology:

ST 506/412 5-1/4" Winchester Drive OEM Manual

Seagate Technology
360 El Pueblo Road
Scotts Valley, California 95066



Tandon Corporation:

TM848-1 and TM848-2 Disk Drives, 48 Tracks-Per-Inch OEM Operating and Service Manual
Tandon part number: 179031

Tandon Corporation
20320 Prairie Street
Chatsworth, California 91311

RMS:

OEM Manual for the RMS-500 Series Disk Drives

Rotating Memory Systems
1701 McCarthy
Milpitas, California 95035

Archive Corporation:

Sidewinder 1/4" Streaming Cartridge Tape Drive Maintenance Manual Archive part number: 20109

Archive Corporation
3540 Cadillac Avenue
Costa Mesa, California 92626



DSD DIAGNOSTIC PROGRAM

APPENDIX B

Description

The DSD program provides an effective and simple means of determining the integrity of the inter-processor communications for the entire system.

The diagnostic program runs primarily on the file processor, with portions running in each of the application processors in the system. It performs bus operations similar to those required by n/STAR and verifies the integrity of each operation. Results are displayed on an easy-to-read, single-page "scoreboard" that accommodates the file processor and up to 63 application processors. The addresses for application processors using DSD must be in the range of 192 to 254 (CO to FE).

The diagnostic program requires a terminal with an addressable cursor and display highlighting (reverse video, dim, etc.). The program is supplied on the distribution/diagnostic diskette as DSDTERM to operate directly with a number of commonly used terminals. It is also supplied on the diskette as DSD, which must be "patched," as described under Installation below, to operate with other terminals (see Operation).

Installation

A limited number of terminals can be configured by using the menu-driven program DSDTERM. If your terminal is not listed on the menu, try each listed to determine whether or not your terminal will work with one of these standard configurations. If it will not, you must use the following DSD patching procedure.

The DSD patching operation involves editing a patch file to specify your terminal's control requirements, assembling the patch file, and overlaying the results onto the diagnostic module. The file DSDPATCH.ASM is provided with the diagnostic for this purpose.

Positioning the cursor is the most complex function performed by the diagnostic, because it involves transmitting both the row and column at which the cursor is to be placed. The form of the control string used to position the cursor varies widely from terminal to terminal and the patch items in the diagnostic for cursor positioning are designed to accommodate almost all commonly used forms. Therefore, it is necessary to analyze your terminal's cursor-positioning control string to determine the information needed to patch the diagnostic.

Some terminals have a single control string to position the cursor at a line (row) and column (character) number. Others have separate control strings, one to position the cursor on a line and another to position the cursor on a column. Some terminals may require the column number to be sent first while others require the row number first. Some expect the row and column numbers in binary form while others use readable ASCII. On some terminals, the row and column numbers require an "offset." That is, some terminals call the upper left hand corner row zero, column zero. Others use row one, column one, while some start with row 32, column 32, to avoid sending control codes in the positioning string. The difference between zero and the actual starting row and column numbers is called the offset.

Refer to your terminal's manual and determine the following:

1. Number and type of characters to be sent at the beginning of the control string.



2. Whether to send row number or column number first.
3. Number and type of characters (if any) to be sent between the row and column numbers.
4. Number and type of characters (if any) to be sent at the end of the control string.
5. Offset to add to row number.
6. Offset to add to column number.
7. Format of row and column number: single byte binary (most common) or ASCII. If ASCII, free-form or number of digits (two or three).

The following examples illustrate how these items are used for typical terminals.

Example A

A terminal requires 1B hex, 3D hex, line number plus 32, column number 32. The data for items 1 through 7 above are:

1. 2, 1B, 3D
2. Row is first
3. none
4. none
5. 32
6. 32
7. Binary

Example B

This terminal requires 1B hex, 01 hex, column number, 1B hex, 02 hex, line number. The data for items 1 through 7 are:

1. 2, 1B, 01
2. Column is first
3. 2, 1B, 02
4. none
5. 0
6. 0
7. Binary



Example C

This terminal requires 1B hex, 5B hex, row number plus one in ASCII, a semicolon, column number in ASCII, 5C hex. The data for items 1 through 7 are:

1. 2, 1B, 5B
2. Row is first
3. 1, “,”
4. 5C
5. 1
6. 1
7. Free-form ASCII

Follow the directions in the provided patch file to apply the information determined above to the cursor addressing section of the file. The following values in the patch file correspond to the items listed above:

1. CLEAD1:
2. CB4LFG:
3. CLEAD2:
4. CTRAIL:
5. LINOFF:
6. COLOFF:
7. ASCUR:

In addition to the above listed items, the values HITE: and WID: specify the number of lines on the screen and the number of characters per line:

The values IVON: and IVOFF: are provided to specify the highlighting control string. IVON: should specify the string to cause a dim display, and IVOFF: should restore the display to bright. If your terminal does not provide dim/bright, you may substitute underline or reverse video. Highlighting is necessary for the proper operation of the diagnostic. Some terminals also require an initialization string at the beginning of the program to specify the display attribute to be used. The values TRMINI: and TRMUMI: are provided for these strings.

To install the patches, use your favorite editor to make the appropriate changes to the file DSDPATCH.ASM and assemble the file with the ASM command to produce the file DSDPATCH.HEX.



Enter the following commands:

```
DDT DSD.COM
IDSDPATCH.HEX
RO
GO
SAVE 13 DSDP.COM
```

Test the program DSDP.COM to make sure it operates properly and repeat the above procedure if changes are necessary. When you are satisfied that the patches are complete, rename the file DSD.COM replacing the original unpatched version. Do not make these changes on the diskette provided with the diagnostic. Save these files for future needs.

Operation

To use the diagnostic program, power up the system in diagnostic mode with the distribution diskette in the drive, as described in the Installation and User Reference Manual, Sec. 3.4. When the prompt A> appears on the screen, type DSDTERM and press RETURN. The screen will display a list of terminals that can be used directly with this program. If the list includes the terminal you are using, enter the number that corresponds to your terminal. If your terminal is not listed, you must use the DSD file and patch it as described under Installation above. After you have called up the diagnostic program, the screen will display

EXCLUDE MODULES IN ERROR (Y OR N)?

Normally, you would enter Y. This will exclude further testing of a failed module and thus prevent a possible bus hang from interfering with the other processors under test.

On rare occasions it may be necessary to continue testing after a failure to determine, for example, failure patterns. On these occasions you would enter N.

After you enter Y or N, the screen will display the name header at the top with the test scoreboard immediately below. Under the scoreboard is a line for error messages and beneath that is the pass counter, which indicates the number of cycles completed.

The scoreboard consists of 64 cells. The cell in the upper left corner is the file processor cell, and the application processor cells follow from left to right down the screen.

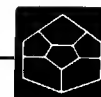
The format of the indicator within each cell is as follows:

```
NN      E      XXX
NN      E      XXX
```

— Error count (decimal)

_____ Error code

_____ Processor address



An indicator will appear only in a cell for which there is an active processor in the system. If a processor is present but its indicator does not appear, that processor either was not reset at the start of the diagnostic program or it is not functioning.

The error code in the indicator can be any of the following:

Code letter	Meaning
(space)	No errors
M	RAM failure
N	No response to test request
S	Request checksum error
T	Data transfer error

The error message line at the bottom of the screen will contain a descriptive error message relating to the latest error. One of the following messages may appear:

RAM FAILURE (FP)
nnn DID NOT RESPOND
REQUEST CHECKSUM ERROR (AP/FP)
DATA TRANSFER ERROR (AP/FP)

The first message may be generated by the file processor RAM test performed at the start of each cycle. This message probably indicates a bad RAM chip.

The second message means that the application processor (represented by the decimal address number "nnn") has failed to respond after starting properly. Pulling an application processor out of the computer after starting the diagnostic will cause this error to appear.

The designation in parentheses (AP/FP) in the last two messages indicated the device that caught the error. For example, a data transfer error message with AP in parentheses indicates that a bad data block was received by the application processor.

The test program operates by sending two types of data blocks between the application processors and the file processor. As such, there are two types of error checking methods employed and, as a result, two kinds of errors, but both relate to the same failure. These errors are the "checksum" and "transfer" errors. They are most often caused by defective PIO chips on the individual processors.

If, after several hours of testing, most or all of the cells contain errors, the PIO on the file processor may be at fault. Try swapping this chip with one from an application processor.

If, on the other hand, only one cell shows an error, the corresponding application processor may have a bad PIO.



GPMON DIAGNOSTIC PROGRAM

APPENDIX C

Description

GPMON is a comprehensive test program that allows you to select, manipulate, and check any portion of the file processor RAM up to memory location F7F7. The program also allows you to test any file processor or application processor port in the system. GPMON is run in diagnostic mode and provides 10 selectable commands, each of which performs a different operation as described below.

Operation

To use GPMON, power up the system in diagnostic mode with the distribution diskette in the drive, as described in the Installation and User Reference Manual, Sec. 3.4. When the prompt A> appears on the screen, type GPMON and press RETURN. The screen will display

```
Molecular Computer
TEST MONITOR V1.1
```

You can now select any of the operations described below by entering the corresponding command. Enter only the first letter of the command and do not press RETURN. To stop any of the routines once it is running, press the SPACE BAR; press BREAK to exit the GPMON program.

NOTE

The GPMON program, when loaded, occupies the RAM space from F7F7 through FFFF. You should, therefore, not specify any address above F7F6 in any of the test routines described below, otherwise you will enter a loop. If you inadvertently enter the loop, you must press BREAK to get out, and reload GPMON to continue using the test program.

DISPLAY - This routine displays the content of each memory location between any two RAM addresses you specify from 0000 to F7F6. To specify the addresses for the display, type

```
FROM aaaa TO bbbb
```

where aaaa and bbbb are the four-character hex addresses for the lower and upper limits, respectively, of the display block. Note that:

- You must always enter four characters to specify a RAM address. If the address is below 1000, you must enter prefix zeros as necessary (e.g., 0100, 0040, etc.).
- The screen will display the hex code contained in each memory location as well as the equivalent ASCII character, if any.
- If the specified display block requires more than 24 lines on the screen, the display will scroll. Press the SPACE BAR to stop scrolling.

ENTER - This command allows you to change the contents of a block in RAM beginning with a specified address. With this routine you can enter any 8-bit code (in hex) into each memory location of the specified block. You can thus enter and run your own test program. To exit the ENTER routine, press RETURN.



FILL - This routine fills each memory location of a specified block with any single 8-bit code specified (in hex).

JUMP - This command is used in conjunction with the ENTER routine. It provides for a jump to any specified memory address to execute the test program entered.

LOAD FROM - This command loads an input program into memory from a specified address.

MOVE FROM - This command will move a block of data from one part of memory to another. To use the command, you must specify the starting source and destination addresses of the block and the length of the block (in number of characters).

Example: To move a block of 200 characters beginning at memory address 1000 to another part of memory beginning at address A000, type M. The screen will display

MOVE FROM

Type 1000 to A000 LENGTH 200

Do not press RETURN. The routine will immediately perform the specified block move operation.

READ PORT - This command will read and display the existing hex code on any specified system I/O port (see Installation and User Reference Manual, Sec. 7.4, for port assignments).

TEST FROM - This routine tests each memory location between any two specified addresses (from 0000 through F7F6). The program tests each location by entering a randomly selected code, reading out the content of the memory cell, and comparing the two values. If the values do not match, the screen displays the address of the location in error along with the data code entered and the code read out.

VECTOR - This command will display the input and output vector codes for the file processor. The information is used in calling up a user-designed test program stored in memory.

WRITE PORT - This command allows you to write any specified 8-bit hex code to any system output port. You can thus generate a corresponding control signal, and also check the port lines with the READ PORT command.



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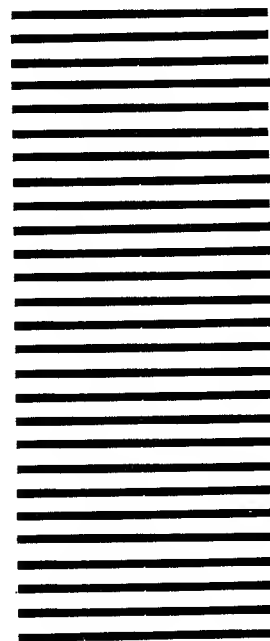
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